AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

JULY 15, 1959

Features • • •

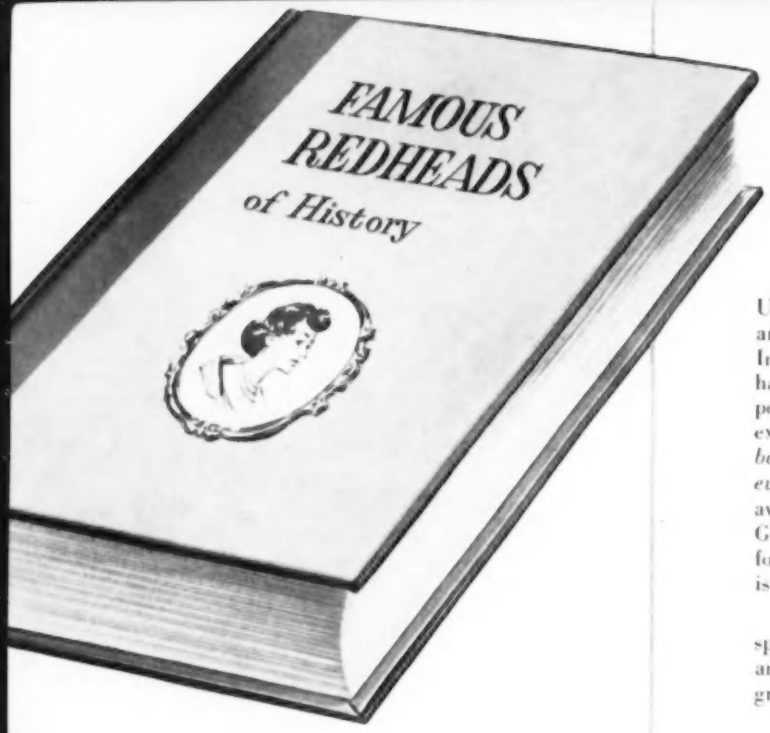
standards ▶

Vice Adm. G. F. Hussey, Jr. reveals Automotive Role in advancing Industrial Standards

PAGE 59

Automotive and Aviation Manufacturing

ENGINEERING • PRODUCTION • MANAGEMENT



in the past...

Throughout the ages, redheads have acquired a reputation for being glamorous, adventurous, unpredictable and often temperamental—greatly admired or greatly envied. Cleopatra, Queen Elizabeth, Madame Pompadour, Mary Queen of Scots, Lady Hamilton, Nell Gwynn, Madame Dubarry, Sarah Bernhardt—some of history's most tempestuous titian-haired beauties undoubtedly contributed to this fame.

In literature, too, redheads have often been cast in similar roles—like Nana, Sadie Thompson, Becky Sharpe and Scarlett O'Hara, to mention just a few.

The relationship between hair coloring and personality may have been sheer coincidence. But the fact remains that redheads usually stand out from the crowd in more than appearance alone.

RED HEAD
HEALD

in the present...

Unlike their feminine counterparts, Heald Red Heads are *not* temperamental and definitely *not* unpredictable. In fact Heald Red Head boringheads and wheelheads have achieved an enviable reputation for dependable performance, based on more than 30 years of operating experience. And today, the Red Head line includes *six basic types*, in sizes, speeds and capacities for virtually *every* metal-working application. Heald Red Heads are available not only for Heald Bore-Matics and Internal Grinders, but also (and many people do not realize this) for use with any similar types or makes of precision finishing machines.

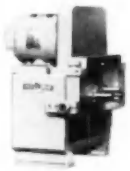
From this complete Red Head line you can select a spindle unit that will help you improve product quality and cut production costs on any boring or internal grinding job.

RED HEAD BELT-DRIVEN WHEELHEADS
Cool-running, permanently lubricated wheelheads for standard belt drive. Sleeve Style, Naked Style and Quill Style heads for speeds up to 10,000 rpm.

RED HEAD HI-FREQUENCY WHEELHEADS
Permanently lubricated or mist lubricated precision wheelheads for Hi-Frequency drive. Naked Style, Quill Style or for mounted point wheels. Speeds up to 100,000 rpm.

RED HEAD HI-SPEED BELT DRIVEN WHEELHEADS
New head design permits small hole grinding at speeds from 45,000 to 100,000 rpm without the need for high frequency generating equipment.

RED HEAD BORINGHEADS
Permanently-lubricated belt-driven boringheads for high-precision Borizing with rotating tools or rotating work. Speeds to 8,000 rpm.; available in a wide range of sizes.



RED HEAD MULTI-SPINDLE BORINGHEADS
Permit simultaneous multiple-hole Borizing with centers as close as ¾". Miniature Precision Red Heads, with common belt drive, mounted in interchangeable precision-bored spindle plates.

RED HEAD BORIZERS
Completely self-contained motor driven, hydraulically powered head units for rotating, feeding and retracting single or multiple tools in automated setups.

It PAYS to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Circle 101 on Inquiry Card, for more data

KNOW YOUR ALLOY STEELS . . .

This is the second of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Effects of Elements Used in Alloy Steels

To simplify a rather complex subject, let's outline some of the individual effects of four leading alloying elements used in alloy steels:

Nickel—One of the fundamental alloying elements, nickel provides such properties as deep hardening, improved toughness at low temperatures, low distortion in quenching certain types of tool steels, good resistance to corrosion when used in conjunction with chromium in stainless grades, and ready response to economical methods of heat-treating.

Chromium—This element is used extensively to increase the corrosion-resistance of steel. It also improves the surface resistance to abrasion and wear. It exerts a toughening effect and increases the hardenability.

Molybdenum—This element exerts a strong effect on the hardenability and toughness of steel. It greatly increases short-time and long-time strength at high temperatures.

Vanadium—An element used to refine the grain and enhance the mechanical properties of steel.

A combination of two or more of the above alloying elements usually imparts some of the characteristic properties of each. For example, chromium-nickel grades of steel develop good hardening properties with excellent ductility. And chromium-molybdenum steels develop excellent hardenability with satisfactory ductility and a certain amount of heat-resistance. In other words, the total effect of a combination of alloying elements is usually greater than the sum of their individual effects. This interrelation must be taken into account whenever a change in a specified analysis is evaluated.

Bethlehem metallurgists can be of considerable help to you in selecting the proper alloy steel for any use. These men will gladly give unbiased advice on alloy steel analysis, heat-treatment, machinability, and expected results. Feel free to call upon them at any time.

And please remember, too, that Bethlehem manufactures all AISI standard alloy steels, as well as special-analysis steels and the full range of carbon grades. You can rely upon their quality, always.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

YOU CAN CUT INVENTORY INVESTMENT OF MECHANICAL TUBING

If you depend on B&W and your local Steel Service Center . . . because:

- . . . your local Steel Service Center maintains large and diversified mechanical tubing stocks, available to you for immediate delivery
- . . . your local Steel Service Center can help you cut handling and storage costs and maintain production continuity

And when it comes to mechanical tubing, ask for B&W Job-Matched Tubing. For information on how this tubing can reduce your production costs call the local B&W District Sales Office or write for Bulletin TB-352. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

AMERICAN STEEL WAREHOUSE ASS'N.

B&W

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

TA-9000-SMI

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

Circle 105 on Inquiry Card, for more data

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

JULY 15, 1959 VOL. 121 No. 2

Features • • •

. . . continued on next page

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES, Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Second Class Postage Paid at Philadelphia, Pa. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, $2.00 per year; $3.00 for 2 years. All Others, $10.00 per year. Single copies, 50¢. Statistical and Products Guide Issues, $1.00 each net.

AUTOMOTIVE INDUSTRIES

Features • • •

continued

News Previews • • •

Departments • • •

AUTOMOTIVE INDUSTRIES COVERS

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS & COMPONENTS • ACCESSORIES • PRODUCTION, SERVICE and MAINTENANCE EQUIPMENT • ENGINEERING • PRODUCTION • MANAGEMENT

The world's most popular

Power Brake is Hydrovac

because . . .

Vacuum power provides instant, effortless power braking *plus maximum dependability* and safety—even if power should ever fail, brakes can be applied manually.

Vacuum power saves dead weight. This can add several hundred extra pounds to every pay-load. And extra pounds mean extra profits.

Vacuum power does the job simpler and better with less maintenance and lower original cost!

Vacuum power steals no horsepower as it is completely free of compressor drain on engine power.

Unchallenged facts like these have made Hydrovac® Vacuum Power Braking first choice among truck operators—in fact, with over 5½ million sold, more Hydrovac units are in use than all other types.

HYDROVAC (VACUUM HYDRAULIC) POWER BRAKING BY BENDIX

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION

CALENDAR

OF COMING SHOWS AND MEETINGS

Second Annual Western Regional Meeting, American Astronautical Society, Ambassador Hotel, Los Angeles, Calif. ..... Aug. 4-5

Industrial Engineering Conference, University of Michigan, Ann Arbor, Mich. ..... Aug. 3-14

ASME-AICE Heat Transfer Conference, University of Connecticut, Storrs, Conn. ..... Aug. 9-12

Western Electronic Show and Convention, San Francisco, Calif. Aug. 18-21

10th International Congress of Applied Mechanics, Congress Building, Stresa, Italy Aug. 31-Sept. 7

14th National ACM Conference, Massachusetts Institute of Technology, Computation Center, Cambridge, Mass. ..... Sept. 1-3

Society of British Aircraft Construction, 20th flying display and exhibition, Royal Aircraft Establishment, Farnborough, England ..... Sept. 7-13

Society of the Plastics Industry, Inc., Midwest Section Conference, French Lick Sheraton, Hotel, French Lick, Ind. ... Sept. 10-11

National Auto Accessory and Parts Exhibit, Las Vegas, Nev. ... Sept. 14-17

National Industrial Conference Board, 7th marketing conference, Hotel Waldorf-Astoria, New York, N. Y. ..... Sept. 16-18

International Automobile Show, Frankfurt, Germany ..... Sept. 17-27

Steel Founders' Society of America, 57th fall meeting, The Homestead, Hot Springs, Va. ... Sept. 21-22

Instrument Society of America, 14th annual instrument-automation conference and exhibit, International Amphitheater, Chicago, Ill. ..... Sept. 21-24

Industrial Nuclear Technology Conference, Morrison Hotel, Chicago, Ill. ..... Sept. 22-24

American Welding Society, national fall meeting, Sheraton-Cadillac Hotel, Detroit, Mich. ... Sept. 23-Oct. 1

Institute of the Aeronautical Sciences, Anglo-American Conference, Hotel Astor, New York, N. Y. ..... Oct. 5-16

American Vacuum Society, sixth national symposium on vacuum technology, Sheraton Hotel, Philadelphia, Pa. ..... Oct. 7-9

ASTE semi-annual meeting, Chase-Park Plaza Hotels, St. Louis, Mo. ..... Oct. 8-10

T-J

LAUNCHES A NEW CUTTING TOOL LINE FOR MILLING ACCURACY

For precision milling to close tolerances, so vital in today's high-speed, high-production manufacturing, T-J now offers a new, improved line of milling cutters. The new cutter line features a high helix angle, double back-off, and a right-hand spiral to produce more and smoother cuts between grinds, and a free-cutting, stronger tool.

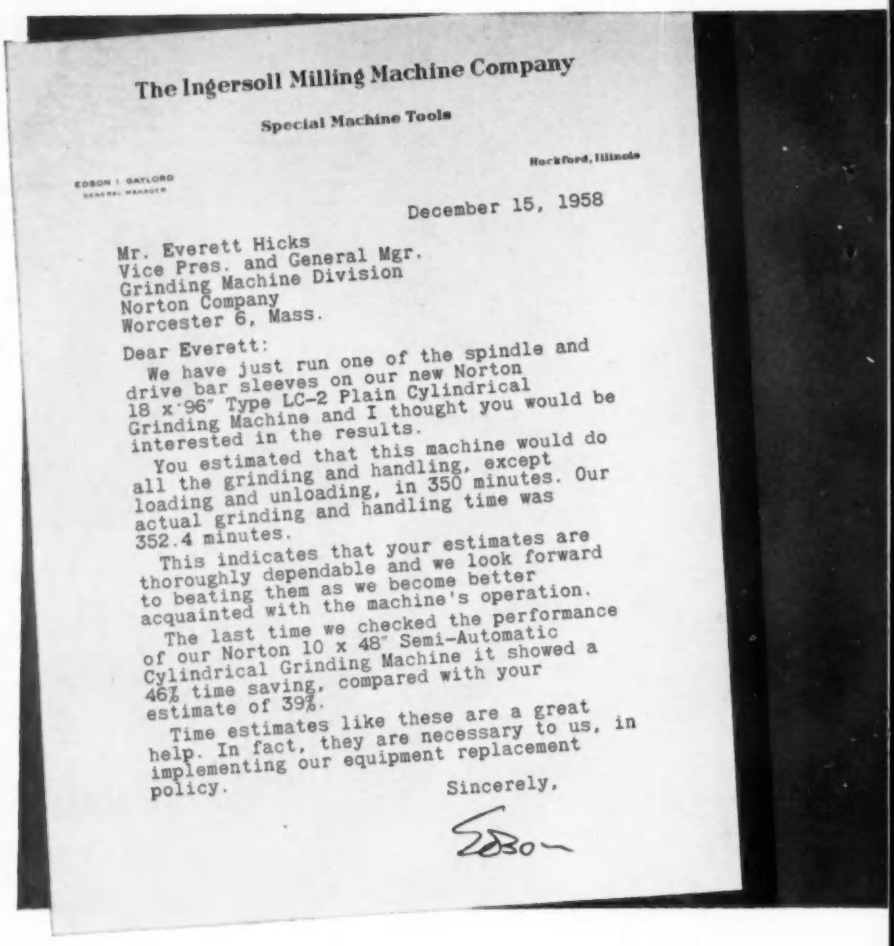
Specially designed and precision-manufactured for die sinking and production milling, the new line is designed to include flats on the shanks for set screw type drivers on all of the end and side milling cutters.

Write today for complete information to the Tomkins-Johnson Company, Jackson, Mich.

Ask for completely new cutter catalogue No. 259.

T-J

TOMKINS-JOHNSON



The Ingersoll Milling Machine Company

Special Machine Tools

Rockford, Illinois

EDSON I. GAYLORD
GENERAL MANAGER

December 15, 1958

Mr. Everett Hicks
Vice Pres. and General Mgr.
Grinding Machine Division
Norton Company
Worcester 6, Mass.

Dear Everett:

We have just run one of the spindle and drive bar sleeves on our new Norton 18 x 96" Type LC-2 Plain Cylindrical Grinding Machine and I thought you would be interested in the results.

You estimated that this machine would do all the grinding and handling, except loading and unloading, in 350 minutes. Our actual grinding and handling time was 352.4 minutes.

This indicates that your estimates are thoroughly dependable and we look forward to beating them as we become better acquainted with the machine's operation.

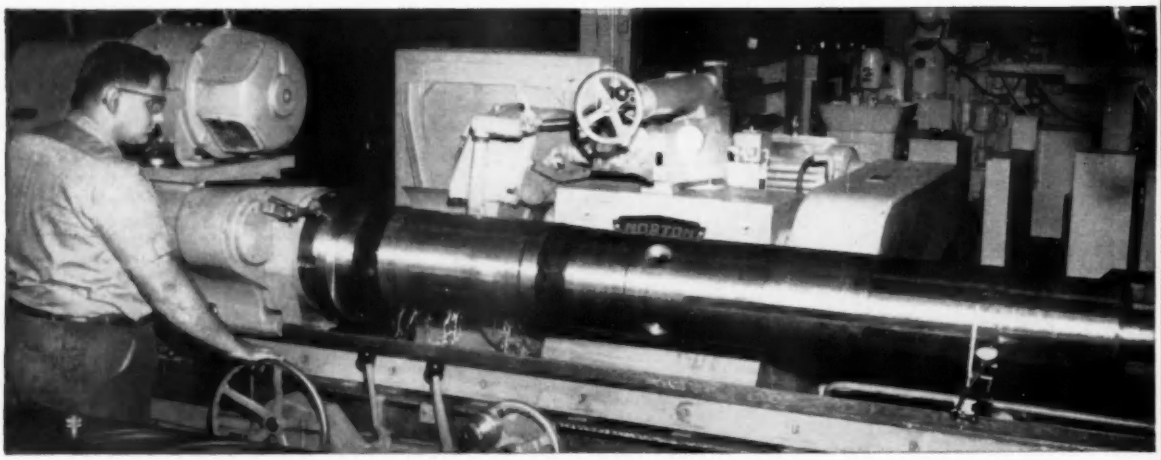
The last time we checked the performance of our Norton 10 x 48" Semi-Automatic Cylindrical Grinding Machine it showed a 46% time saving, compared with your estimate of 39%.

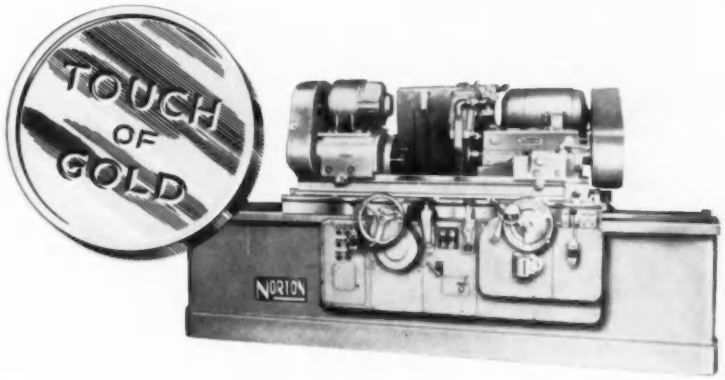
Time estimates like these are a great help. In fact, they are necessary to us, in implementing our equipment replacement policy.

Sincerely,

Edson

Ingersoll reports how Norton Cylindrical Grinders save





as predicted

As Mr. Gaylord, the Ingersoll Milling Machine Company's General Manager, points out, Norton machines will give you increased production.

This increased production is just one of the proved "Touch of Gold" advantages of Norton grinding machines. Others are precise sizing control, low maintenance and long, continuous service life. These are designed into each machine.

Norton Cylindrical Grinders have swing capacities ranging from 4″ to 24″ and work lengths from 18″ to 168″. All are available as Plain Machines or Semiautomatics. All have controls for feeds and speeds grouped at the operating position, with key maintenance points located outside. And all are engineered for adaptability to meet changing production requirements, and for durability to keep on delivering economy under the toughest conditions of use.

Call in your Norton Sales Engineer, a well trained, long experienced specialist in grinding. He'll gladly give you an accurate estimate of what Norton grinding machines can do for you. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

Photos show the types of cylindrical grinders used and described by the Ingersoll Company. Photo at upper right is a Norton 10″ x 48″ Type CTU; photo at left was taken in the Ingersoll plant, and shows their Norton 18″ x 96″ Type LC-2.

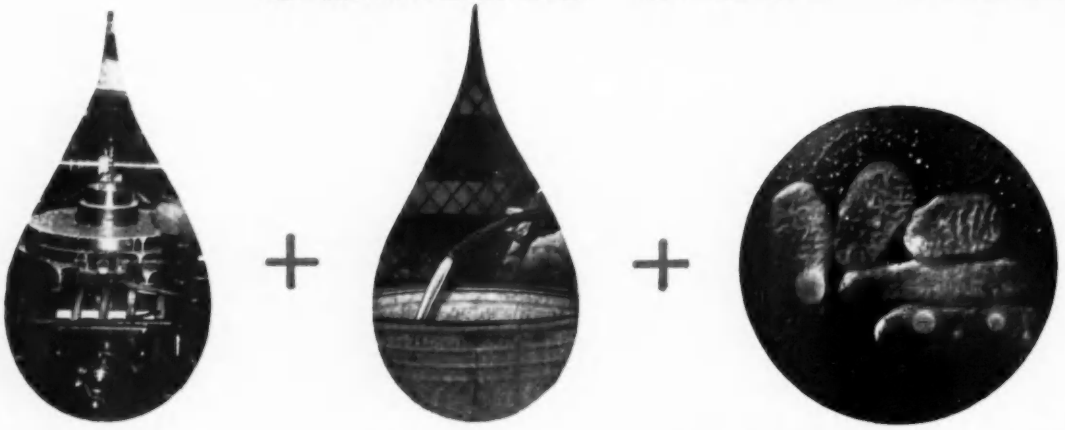
NORTON
GRINDERS and LAPPERS

Making better products
...to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Circle 109 on Inquiry Card, for more data

"Summer Odor" from



SOLUBLE OIL + WATER + PSEUDOMONADS

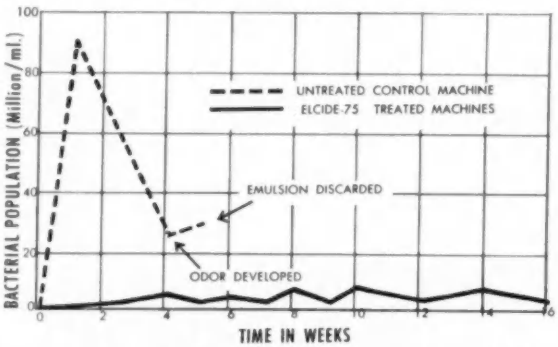
...can be controlled

Nearly everyone has experienced the "rotten egg" smell of spoiled soluble oil emulsions. Here's an explanation of what happens to cause it... and how you can control it with Elcide 75.

THE CAUSE: The oil-and-water mixture of a standard duty soluble oil emulsion produces ideal feeding conditions for certain bacteria. One of the most common types, *pseudomonads*, can be found in all emulsions. Once established, they multiply rapidly . . . especially in warm weather . . . and feed on the emulsion.

As these pseudomonad colonies build up, they set the stage for a secondary contamination by sulfate-reducing bacteria. These bacteria feed on the petroleum sulfonates commonly used as the emulsifying agent in soluble oils. As they multiply, they throw off H_2S, the hydrogen sulfide gas known in metalworking plants as "summer odor."

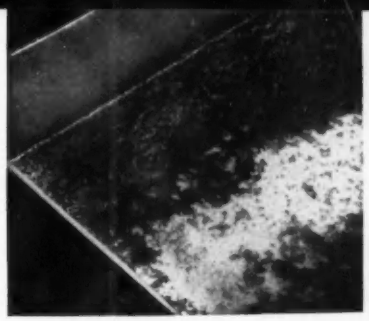
Unfortunately, the damage from bacterial contamination does not end here. As the odor develops, the bacteria continue feeding on the emulsifier until the emulsion breaks. This process changes the mixture from alkaline in composition to corrosive acid. Other by-products from the bacteria form a slime that clogs screens and filters, and presents certain hygienic hazards.



This record of an actual in-plant test shows how untreated emulsion allows rapid bacterial build-up. The downward curve of the untreated emulsion is where secondary contamination by the sulfate-reducing bacteria starts its final destruction. Note the comparison between this and the Elcide 75-treated emulsion which lasted 5½ times longer.

ELI Lilly AND COMPANY • AGRICULTURAL AND INDUSTRIAL PRODUCTS

rancid emulsions

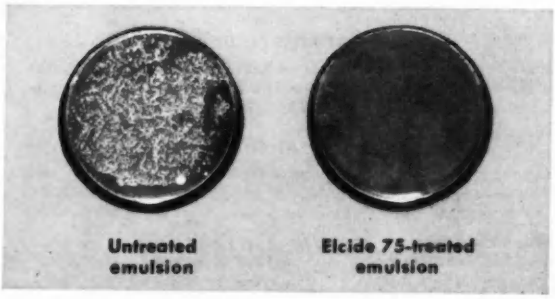


$+ \rightarrow H_2S\uparrow$

SULFATE-REDUCING BACTERIA

(SUMMER ODOR)

with ELCIDE 75



THE CURE: **ELCIDE 75 hits this problem at the very first stage** of bacterial growth. The petri dishes above show the contrast between an untreated emulsion and an emulsion treated with Elcide 75. The light areas in the untreated sample are bacterial colonies. Because Elcide 75 is a new, wide-spectrum bacterial inhibitor, it attacks and controls not only the more common bacteria, but also mutants which frequently develop. Just one ounce of Elcide 75 to each 4 gallons of fresh emulsion breaks the vicious cycle of bacterial growth before it starts . . . thereby greatly extending the useful life of your coolant.

ELCIDE 75 is a reliable way to prevent the waste of frequent emulsion changes. Its wide range of antibacterial action insures a constant control that not only prevents summer odor, but also reduces production costs. Many plants have thoroughly tested Elcide 75 in comparison to untreated emulsions. Their findings indicate Elcide 75-treated emulsions last far longer, reduce downtime and oil concentrate costs, and increase total productivity.

If you have not yet tried Elcide 75 in your plant, we urge you to try it now . . . before the heat of summer further inflates your personnel problems and operating expenses.

PRODUCT SPECIFICATIONS—ELCIDE 75

(Lilly's brand of bacterial inhibitor for cutting fluids)

Active Ingredients—Sodium Ethylmercuri Thiosalicylate (Thimerosal) and Sodium *o*-phenylphenate.

Package	Price per Gal.
1-gal. (4 per case) polyethylene	$8.50
5-gallon polyethylene	$8.00
55-gallon stainless steel	$6.50

Sold only through selected distributors.

For more information or to place your order, write or phone:

ELCIDE 75™

PATENT PENDING

KEEPS COOLANTS FRESH AS A DAISY!

DIVISION

INDIANAPOLIS 6, INDIANA
Telephone: MElrose 6-2211

LINDBERG
Covers the Entire Field of Industrial Heating Equipment

Wherever a product, a part or a process needs the application of heat, Lindberg equipment is available, or can be expertly designed and engineered to apply it most efficiently and most economically. The following list indicates how comprehensively Lindberg covers the field of "heat for industry."

HEAT TREATING FURNACES

Enclosed Quench Carbonitriding and Carburizing Furnaces *(Gas Fired With Vertical Radiant Tubes—Electric With Corrtherm Elements)* · Cyclone Tempering Furnaces · Super Cyclone Furnaces *(for temperatures to 1750° F.)* · Box Hardening Furnaces · Vibrating Hearths · Reciprocating Conveyors · Carbottom Furnaces · Pusher Furnaces · Mesh Belt Conveyors · Cast Link Conveyors · Roller Hearths · Rotary Hearths · Pit Hardening and Carburizing Furnaces · Rectangular Bell Furnaces · Cylindrical Bell Furnaces · Pot Furnaces · Vacuum Furnaces · Rotary Retort Furnaces · Vitreous Enameling Furnaces · Strip and Wire Continuous Annealers · Continuous Bar Heating Furnaces · Semi-continuous High-Speed Furnaces · Globar Furnaces of all types · Molybdenum High Temperature Furnaces (Electric) · Salt Bath Furnaces of all types

Lindberg Heat Treating Furnaces can be supplied in either fuel fired or electric types.

ATMOSPHERE GENERATORS

HYEN Generator (Endothermic) · HYEX Generator (Exothermic) · HYNI Generator (99.99% pure nitrogen) · HYAM Generator (Dissociated Ammonia) · HYCO Generator (Charcoal)

FURNACES FOR NON-FERROUS METALS

Aluminum Die Casting Furnaces · Aluminum Reverberatory Furnaces · Autoladle for Automatic Aluminum Ladling · Blowers · Electric Resistance Melting and Holding Furnaces · Electric Resistance Reverberatory Holding Furnaces · Hand-Tilt Crucible Furnaces · Hand-Tilt Semi-Muffle Crucible Furnaces · Iron Pot Furnaces · Motor or Hydraulic Tilting Furnaces · Rotary Open-Flame Smelting Furnaces · Stationary Floor Mounted Crucible Furnaces · Stationary Pit Crucible Furnaces · Two-Chamber Induction Furnaces

HIGH FREQUENCY UNITS

Line Frequency Equipment for: Billet Heating for Extrusions · Ring Heaters for Shrink Fitting · Dual Frequency Heating

Motor Generator and Radio Frequency Equipment for: Hardening · Annealing and Stress Relieving · Brazing and Soldering · Hot Forming and Forging · Shrink Fitting · Sintering · Crystal Growing and Zone Refining · Standard and Special Work Handling Mechanisms *(Manually operated, semi-automatic and fully automatic)*

PILOT PLANT EQUIPMENT

(ELECTRIC)
Atmosphere and Non-Atmosphere Box Furnaces · Atmosphere Tube Furnaces · Crucible Pot Furnaces · Vacuum Furnaces · High Frequency Units *(for temperatures to 4100°F.)* High Temperature Furnaces *(for temperatures to 5000°F.)*

PERIODIC KILNS

Shuttle Kilns · Bell Type Kilns · Box Kilns · Carbottom Kilns · Elevator Kilns

CONTINUOUS KILNS

Car Type Tunnel Kilns · Pusher Slab Type Tunnel Kilns · Rotary Calciners · Belt Type Calciners · Automatic Ceramic Kilns

Lindberg Kilns can be supplied in either fuel fired or electric types, with or without atmosphere control.

LABORATORY EQUIPMENT

Box Furnaces (Electric) · Combustion Tube Furnaces (Electric) · Atmosphere Generators · High Frequency Carbon and Sulphur Combustion Units (Electric—*Complete with Analysis Equipment*) · Electric Hot Plates

INDUSTRIAL DIVISION

Offering complete consulting, design, engineering, manufacturing and field installation service covering complete industrial plants, production lines and special automatic machines, industrial furnaces, ovens and dryers including:

Rotary Billet Heaters · Walking Beam Type Billet Heaters · Automatic Roller Hearth Bright Annealers · Recirculating Type Coil Annealers · Roller Rail Type Annealers · Continuous Bar Heaters · Continuous Automatic Pickling Machines · Continuous Rod and Tube Annealers · Continuous Automatic Glass Annealing Lehrs · Tray Type Stress Relieving Furnaces · Continuous Automatic Gas Carburizing Lines · Continuous Multiple Strip Annealing Furnaces · Batch Type Recirculating Draw Furnaces · Aluminum Reverberatory Melting and Holding Furnaces · Gantry Type Hardening Furnaces · Porcelain Enameling Furnaces · Steel Tube Conveyor Type Normalizing Furnaces · Continuous Pusher Type Forge Furnaces · Continuous Automatic Mesh Belt Conveyor Bright Annealing Furnaces

For comprehensive Lindberg service consult your local Lindberg Field Representative (see your classified phone book) or get in touch with us direct.

LINDBERG ENGINEERING COMPANY

2491 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California

LINDBERG ASSOCIATE COMPANIES

ARGENTINA
Lindberg-Argentina, S.R.L.
Buenos Aires

AUSTRALIA
Lindberg Engineering Co.
Melbourne

CANADA
Efco-Lindberg, Ltd.
Toronto

FRANCE
Etablissements Jean Aubé
Paris

ITALY
Lindberg Italiana, S.P.A.
Milan

SOUTH AFRICA
Efco-South Africa
Johannesburg

SPAIN
Aube-Lindberg, S.A.E.
Barcelona

ENGLAND
Electric Resistance Furnace Company, Ltd.
Weybridge, Surrey

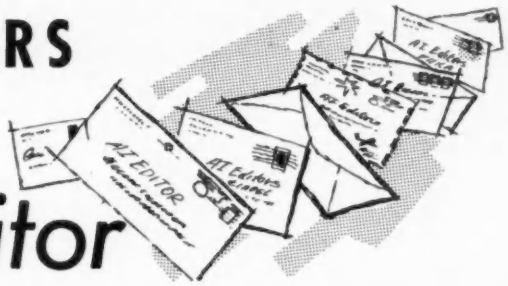
WEST GERMANY
Benno Schilde Maschinenbau AG
Bad Hersfeld

JAPAN
Lindberg Japan Engineering Company, Ltd.
Tokyo

SWITZERLAND
Efco-Industrieofen A.G.
Basel

LINDBERG heat for industry

LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

OPTICAL GAGING

Thank you for permission to reprint the article "Optical Gaging for Inspecting the Inside Surface of Hollow Part," as it appeared in the April 1 issue of AUTOMOTIVE INDUSTRIES. As previously stated, we believe that this article will prove of great value to us in our work with the various Deere plants.

L. K. Vollenweider
Manager
Quality Control Dept.
Deere & Co.
Moline, Ill.

FENDER PRODUCTION

I would like you to know how pleased we are with the story "Budd Produces Chevrolet Fenders at a Rate of 850 per Hour," which appeared in the June 1 issue of AUTOMOTIVE INDUSTRIES. The writer did a fine job on a technical and difficult subject.

Joseph B. Kelly
The Budd Co.
Philadelphia 32, Pa.

ELECTRIC CAR

Please give us the name and address of the manufacturer or the sales company for the British-built electric car that was shown in the June 15 issue of AUTOMOTIVE INDUSTRIES.

Charles F. Strecker
President
Strecker Oil Co.
10159 Hamilton Pike
Cincinnati 31, O.

● *Suggest you contact the manufacturer, Traction Electric, Ltd., Stone Farm, Stone St., Stelling (near Canterbury), Kent, England.—Ed.*

SAFETY REPORT

We are interested in obtaining a copy of a report on the Government study of Federal Highway Safety, conducted by Mr. C. W. Prisk of the Bureau of Public Safety. This study was mentioned in an article "Federal Highway Safety Study Sheds New Light on Accidents" that appeared in the May 1 issue of AUTOMOTIVE INDUSTRIES. Any assistance you can give us in obtaining this report will be very much appreciated.

Clayton M. Allen
Engineer in Charge
General Plant
Dept. of Water and Power
The City of Los Angeles

● *The only copy of the report we have is for reference purposes. Suggest you write directly to Mr. Prisk at the Bureau of Public Roads, Washington 25, D. C.—Ed.*

DE SOTO MODEL

I was just re-reading the March 1 issue of AUTOMOTIVE INDUSTRIES and on page 11 came across an article on the DeSoto Seville. It states that this is a new model for the Firedome and Fireflite series, and is in honor of DeSoto's 30th anniversary. I am wondering if this is a new model, or just a new model of the Seville. I have a 1956 DeSoto Firedome Seville.

S. M. Bennet
Product Development Laboratory
Cities Service Research and Development Co.
Cranbury, N. J.

● *This Seville is not actually a new model, but a revival of the 1956 DeSoto Firedome Seville.—Ed.*

The following table shows the variations of drain-and-refill practices between the 1959 popular makes of cars and trucks:

Make	Fitted With Differential Drain Plug
CARS	
BUICK	No drain plug
CADILLAC	No drain plug
CHEVROLET	Yes
CHRYSLER	Yes
DESOTO	Yes
DODGE	Yes
EDSEL	Yes
FORD	Yes
LINCOLN	No drain plug
MERCURY	Yes
OLDSMOBILE	No drain plug
PLYMOUTH	Yes
PONTIAC	No drain plug
RAMBLER	No drain plug
STUDEBAKER	Yes
TRUCKS	
Chevrolet	Some models only
Dodge	Yes
Ford	Yes
G.M.	Some models only
International	Yes
Studebaker	Yes
Willys	Yes

Report No. 4: *Why not reinstall*

and re-establish regular drain-and-refill recommendations

In general, the majority of the automotive manufacturers and axle suppliers have satisfied themselves that the new gear lubricants now available nationally will provide good lubrication. Of the 22 popular "makes" of cars and trucks, however, only 13 recommend drain-and-refill practices (and have differential drain plugs) on the 1959 models. Three are completing additional evaluation study; six have certain reservations which it would be advisable to examine.

RESERVATION No. 1—"Do the improved gear lubricants properly lubricate limited-slip differentials?"

On the affirmative side of this question stands more than a year of extensive field experience with the improved lubricants which shows conclusively that they perform well in most limited-slip differentials. One factor that prompts this question is that the new specification MIL-L-002105A (Ord.) does not contain a limited-slip requirement. Nonetheless, two major suppliers of limited-slip designed axles unequivocally sanction the use of the new gear lubricants in their axles.

RESERVATION No. 2—"The new gear lubricants are different. How do I know that they will not affect standard seals and packings?"

This question is important because ALL lubricants—the old, the new, and even "doctored" factory-fills—appear to degrade seals and packings under standard laboratory tests. The fact is—standard laboratory tests of seals and packings neither reflect nor closely parallel actual field service. In the past three years of use the new gear lubricants have not presented problems with seals and packings any different from those encountered with either factory-fills or the old MIL-O-2105 gear oils.

RESERVATION No. 3—"These gear oils cost the user more per pound and returning the differential drain plug would also cost the automotive manufacturer some money."

Calculated out, the cost of regular drain-and-refill on an ordinary passenger car would increase maintenance cost by roughly $1.85-$2.00 per year with a 10,000-mile differential oil change. Considering that one gear job can cost from $75 to $125, and takes a car out of service for 1 to 3 days . . . the cost of regular drain-and-refill would appear to offer a real bargain.

The cost of the drain plug could be the cheapest "model-preference" insurance the automotive manufacturer could buy. It only takes one major rear-end job to sour a buyer; noisy rear-ends on the used-car market can attach an undeserved stigma to a make or model.

Car marketing departments know full-well that the used-car buyer of today is the new-car buyer of tomorrow. It is in the two-, three-, and four-year-old cars that gear failures from contaminated lubricant and corrosion occur. Such repairs are not blamed on the lubricant—but on the "engineering" or the "material" of the particular make. In the face of this, drain plugs are cheap.

RESERVATION No. 4—"Truck axles have to operate at high temperatures: I am not certain that the new gear lubes will withstand this temperature."

Over three years of extensive usage has not turned up one case of difficulty from thermal stability in axles.

Service Manual Recommended Drain-and-Refill	
No drain recommended	
No drain recommended	
*10,000	
20,000	
20,000	
20,000	
No drain recommended	
No drain recommended	
No drain recommended	
No drain recommended	
No drain recommended	
20,000	
No drain recommended	
No drain recommended	
10,000	
*15,000	
20,000	
10,000	
10,000	
10,000	
10,000	
10,000	*Drain factory-fill at 1,000.

differential drain plugs in service manuals?

Some early oils now withdrawn from the market gave some stability trouble in heavy-duty *transmissions*. It is believed that the issuance of the MIL-L-002105A Specification has eliminated the possibility of this difficulty reoccurring.

RESERVATION No. 5—"The new gear oils will not work interchangeably in differentials, transfer cases, and transmissions."

While it is to be hoped that ultimately a true universal-purpose lubricant may be developed, it may never be. For the automotive manufacturer to ignore the improved lubrication for differentials would be akin to the car buyer refusing to buy a new car until a design was offered that would serve as a station wagon, a passenger sedan, and a sport convertible . . . or no car at all until all possible engineering improvements have been built in.

The most convincing proof of any lubricant is field service. The improved gear oils have been accumulating service laurels for over 36 months. These service records are available to any manufacturer who would like to examine the rather voluminous evidence.

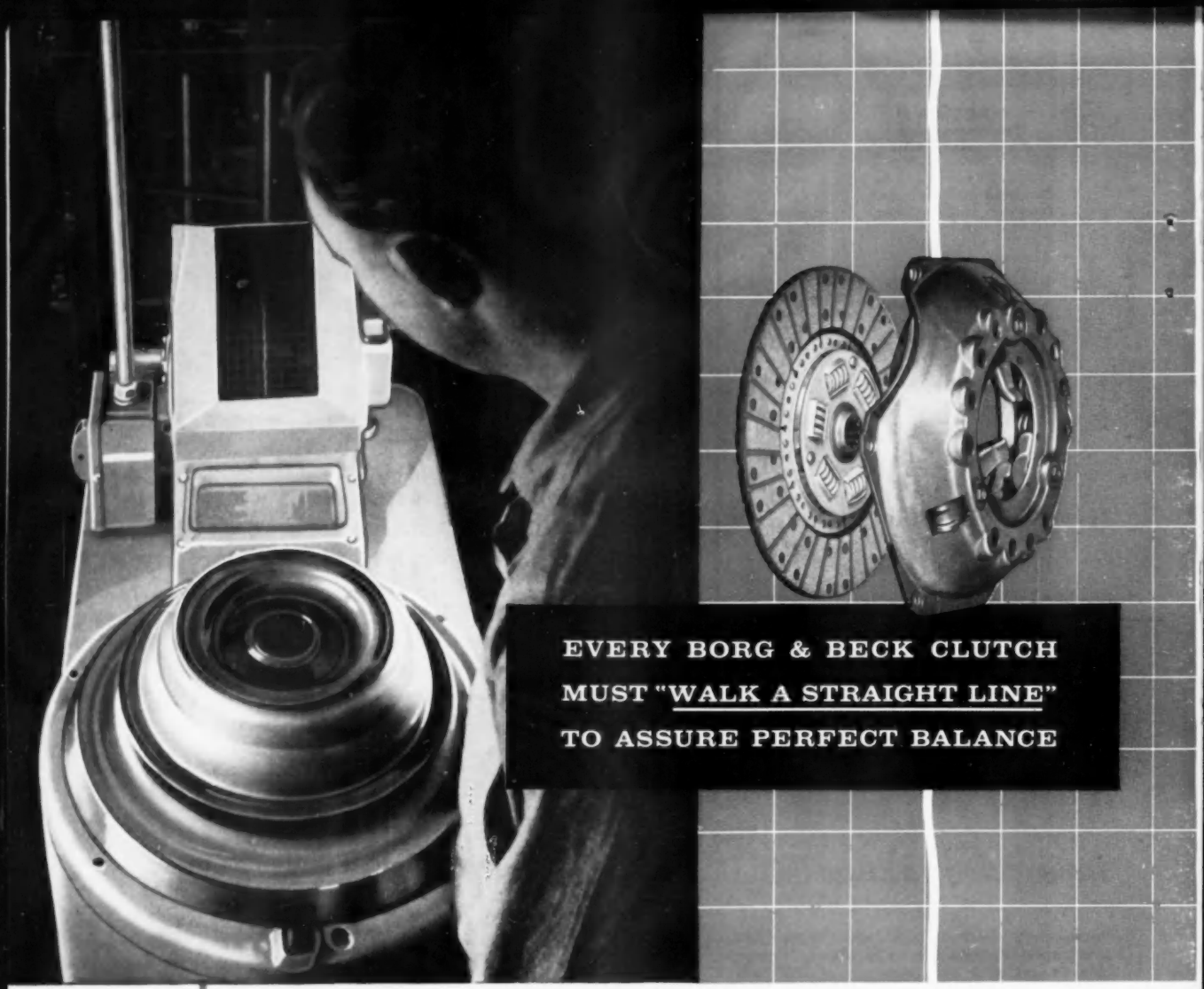
RESERVATION No. 6—"Has the industry had enough actual use experience with these lubricants to warrant my recommending their use on a regular drain-and-refill basis in my 1960 model's service manual?"

Yes—these lubricants have been successfully used in every geographical area in every variety of differential service for over three years. During this time, all field reports indicate that differential failure due to faulty lubrication has become virtually nonexistent.

This series of reports is published to assist in bringing together the mutual interests of automotive manufacturers, gear lubricant producers, and the Military in the general adoption of the new, improved gear lubricants. The purpose of the reports is to coordinate the re-establishment of regular drain-and-refill practices with axle differentials. This step—if taken simultaneously across the automotive industry—will now provide better lubrication in the operation of passenger cars, trucks, buses, as well as Military vehicles.

If you would like a copy of all five of the reports that will be published in this series, simply write Monsanto Chemical Company, Petroleum Chemicals Department, St. Louis 66, Mo. Request a copy of "IMPROVED GEAR OILS." A complete set of the reports will be sent to you.

The additives for Monsanto® *formulating these improved gear lubricants are sold competitively in ample commercial supply.*



EVERY BORG & BECK CLUTCH MUST "WALK A STRAIGHT LINE" TO ASSURE PERFECT BALANCE

Probably the most important single quality in a clutch is *balance*—because balance means smoothness of operation, not only of the clutch but of the engine as well.

That's why Borg & Beck clutches are checked for balance, at operational speeds, on specially designed test machines. Even the slightest unbalance is instantly detected and carefully corrected. Perfect balance is assured, as shown above, when the electric beam of the oscillograph is vertically straight on the calibrated screen. And every Borg & Beck clutch must "walk this straight line" before it passes inspection.

This is typical of the extra care that goes into every step in the making of Borg & Beck clutches. It is your assurance of top quality, top performance, top value.

BORG & BECK®

THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

Export Sales: Borg-Warner International, 36 S. Wabash, Chicago 3

Circle 114 on Inquiry Card, for more data

Quality . . . the best economy of all

He does a better job when he can see what he's doing

You increase operator efficiency as well as production when you use transparent, heavy-duty Sunicut cutting oils. Operators work better, because Sunicut oils let them see tools and workpieces, see the finish, see micrometer graduations.

Sunicut oils don't stain hands and clothing. They pump easily, wet metal fast, and give excellent extreme-pressure lubrication.

To prove to yourself the economy of Sun quality, ask your Sun representative to help you select the right grade of Sunicut for your heavy-duty cutting requirements. Or write to SUN OIL COMPANY, Dept. I-13, Philadelphia 3, Pa.

•

In Canada: Sun Oil Company Limited, Toronto and Montreal.

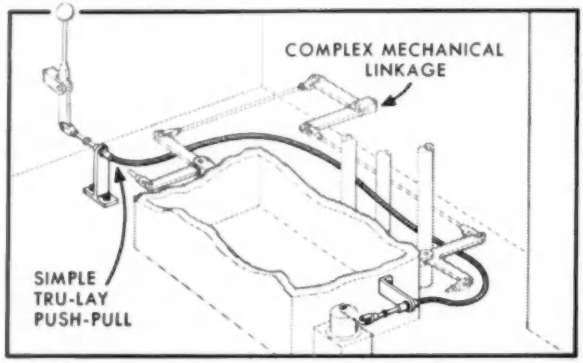
MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO

with TRU-LAY PUSH-PULL controls, you can---

MAKE HUNDREDS OF PRODUCTS MORE USEFUL, EASIER TO SELL

Tru-Lay Push-Pull controls provide positive remote action over long or short distances. Because they operate while flexing, they can snake around obstructions. They are ruggedly constructed, easily installed and operated, and are sealed against dirt and moisture. Push-Pulls are simple, have but one moving part, are noiseless, and give a lifetime of accuracy. Linkages, on the other hand, are complex. They're made of many parts, wear at many points, and produce increased backlash, lost accuracy, and vibration rattles.



Here's Why Push-Pull Controls Simplify Design, Give Better Performance

Long Life—We have never heard of a Tru-Lay Push-Pull wearing out in normal service.

Dependable Operation—Top performance under the most adverse conditions...in temperatures ranging from −70°F to the high levels of jet engine operation...in wet locations...in abrasive atmospheres.

Freedom from Trouble—Inner working member is fully protected by tough, flexible conduit...lifetime factory lubrication...sealed against entrance of dirt, moisture, and other foreign matter...cold swaging of all fittings.

Accuracy—Built to the most exact standards of quality and precision. On automobile pushbutton transmissions, for instance, Push-Pull controls provide five positions with a total movement of only .560".

Capacity—Push-Pull controls will handle jobs with as much as 1,000 lbs. input, 150 feet or more from the control point.

Adaptability—Push-Pull controls can be adapted to countless applications. Standard anchorages, fittings, and heads meet almost any requirement, and modifications can be made to fit special situations.

Design Engineers Report on Benefits

Saves Time, Labor, and Material
"We use Push-Pulls to operate clutch controls on the main power unit, feed conveyors, and delivery conveyors...and we save the time, labor, and material required for planning and engineering the old linkages."

Greater Flexibility of Design
"Push-Pulls give us flexibility in locating the hydraulic control valve in relation to the operator's position."

Cost Less to Install
"They are easier and less expensive to install than linkages for remote control of power take-off."

Solution to Tough Problem
"Can be installed where straight rods are impossible."

Eliminates Maintenance
"No maintenance whatsoever; not even lubrication is required."

Reduces Number of Parts
"Your Push-Pulls have eliminated links, radius rods, and other lost-motion devices for remote control of hydraulic valves."

Provide Accurate Control
"We get minimum backlash because the cable is designed to close tolerances with minimum drag and lost motion."

Push-Pulls Can Help Solve YOUR Remote Control Problems

Push-Pull controls are solid as a rod and flexible as a wire rope. You can use them in the electrical, hydraulic, and pneumatic systems on construction equipment, on farm implements...almost *anywhere* convenient remote control is desired. For complete details on how you can use them, write for a copy of the Push-Pull Data File. It contains 7 bulletins which describe in detail the operation of Push-Pulls, their applications, features, and advantages. Our engineers will be glad to help you make Tru-Lay Push-Pull controls a part of your product.

Automotive and Aircraft Division
AMERICAN CHAIN & CABLE

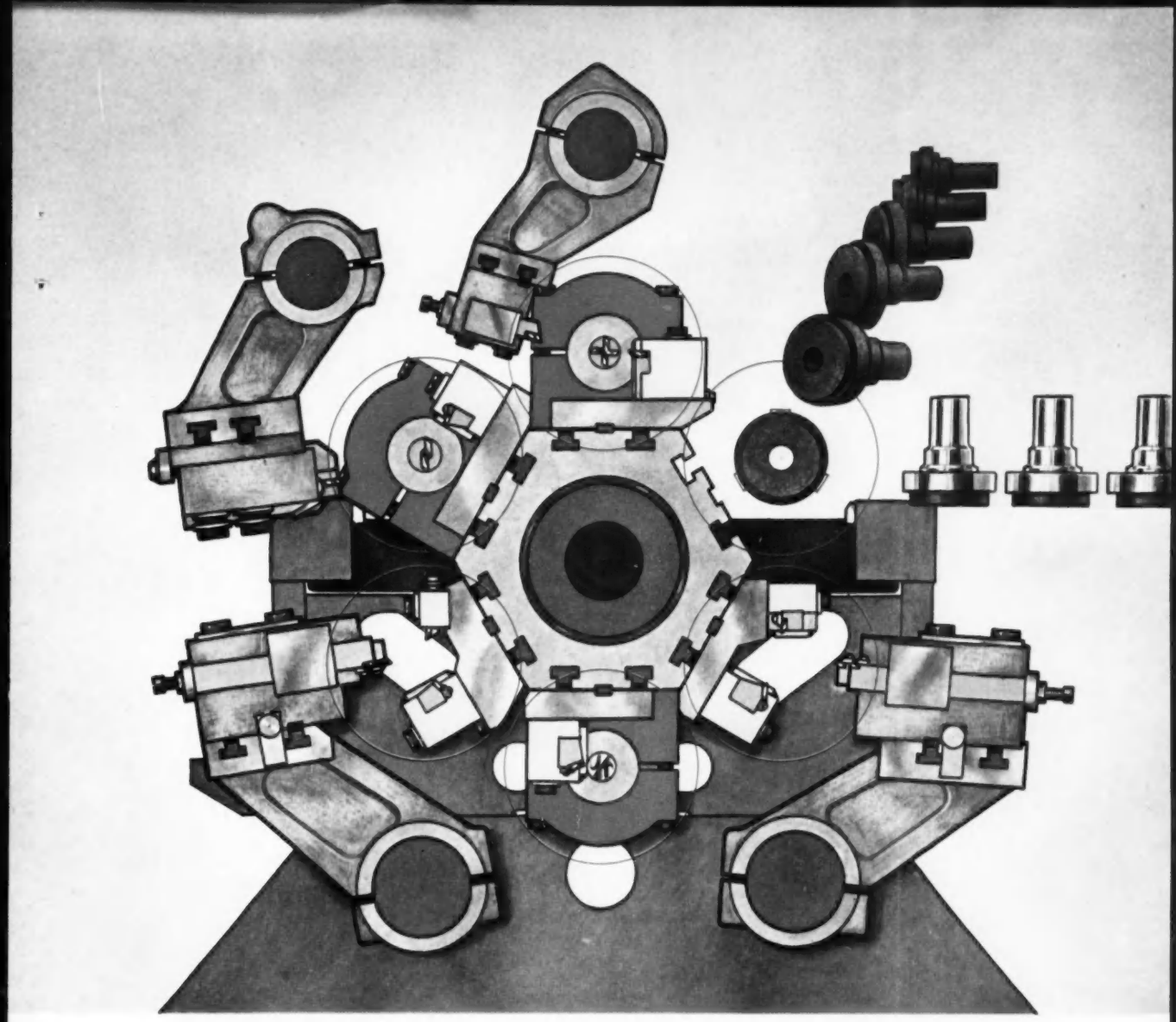
ACCO
TRADE MARK

601-H Stephenson Bldg., Detroit 2
6300-H East Acco Street, Los Angeles 22 • 929-H Connecticut Ave., Bridgeport 2, Conn.

Circle 116 on Inquiry Card, for more data

← Circle 115 on Inquiry Card, for more data

Circle 117 on Inquiry Card, for more data →



two *approaches to the depreciation problem*

Until there is relief in the form of a more liberal tax depreciation policy, there's only one way to avoid the pinch of a shop full of over-age machines you can't afford to replace: *Buy machines that will stay new.*

If you are a user of New Britain chuckers you have seen their basic principles continue to stand as the most advanced design available, year in and year out.

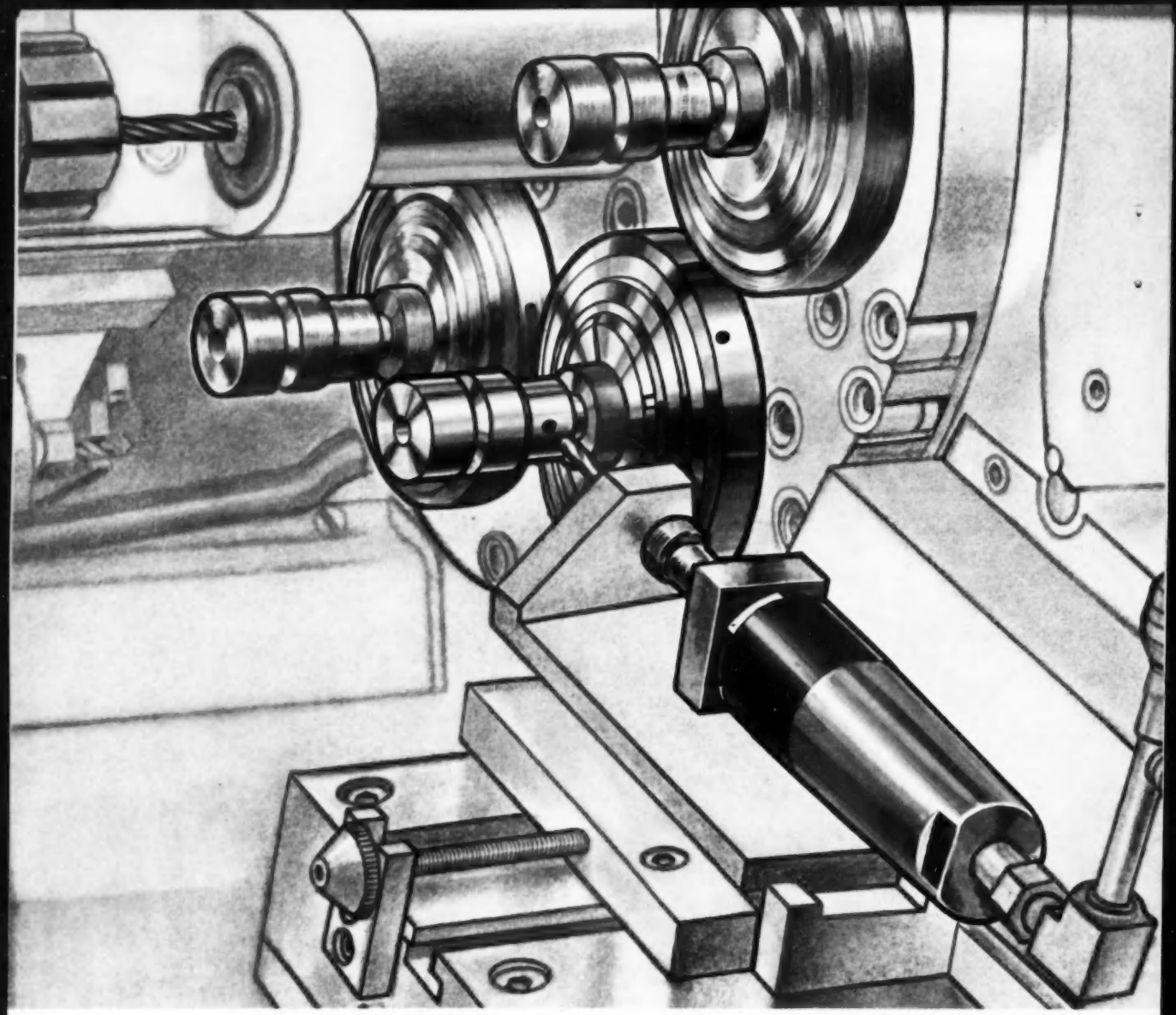
What value do you place on lifetime machine accuracy? The spindle carrier is the heart of a chucking machine. On a New Britain the carrier is lifted during index so it can't wear—then positively clamped to the frame during the cutting cycle for accurate cutting.

Interested in heavy facing and forming cuts? The long established New Britain swinging forming arm feature remains the best answer.

Want maximum clearance for fast and easy tooling, adjustment, and chip removal? Only New Britains are built with open end construction.

Today's New Britain chuckers provide the spindle speeds and power to take advantage of the most modern cutting tools. Optional tooling equipment includes drill speeders and attachments for reversing and non-reversing threading, recessing and accelerated reaming.

A new catalog describes the full New Britain line of 4-, 6- and 8-spindle, open-end, chucking machines. Fully illustrated in color, showing actual jobs, it may well suggest ideas for doing your work. Write for your copy. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



1960 productivity **now**

If you have a voice in the purchase of machine tools you have probably begun to think in terms of what will be on exhibit at next year's Machine Tool Show.

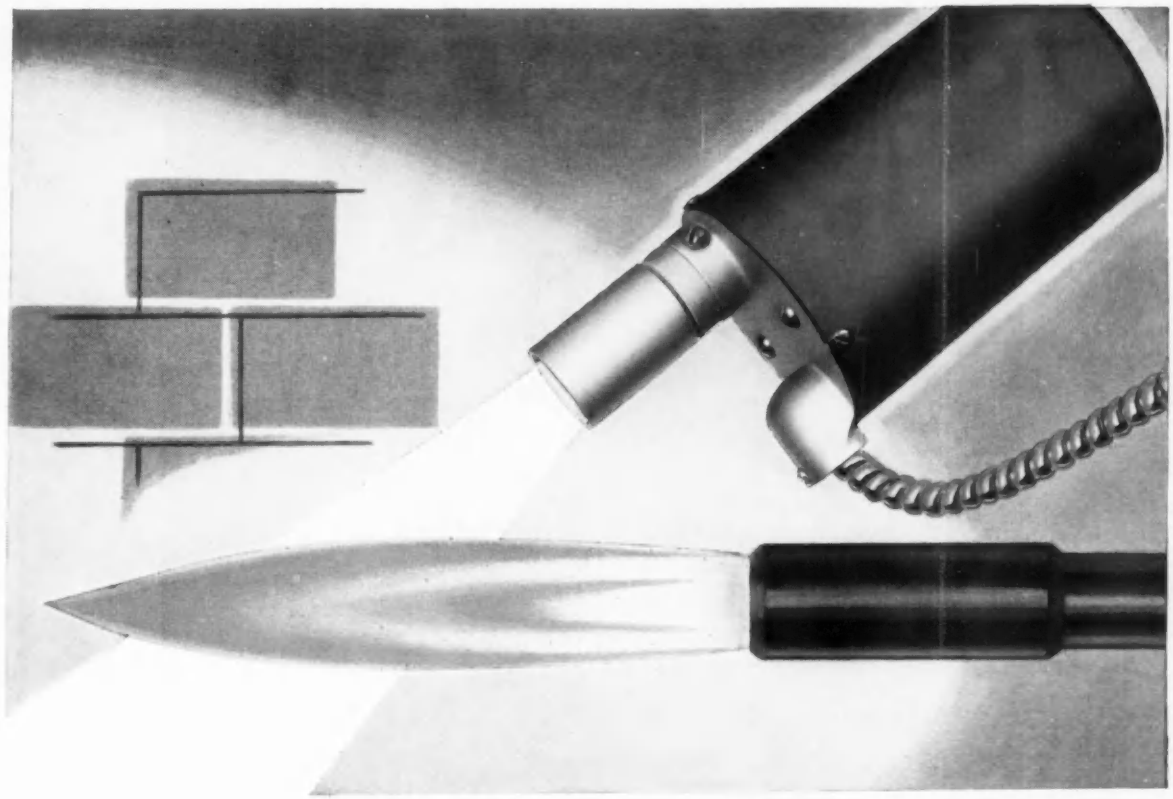
As far as multiple spindle bar work is concerned, you can see and buy and profit from the "show year" developments of New Britains a year ahead of time.

More operations, more pieces per hour, at closer tolerances has been the demand for years. Now New Britain has brought out a complete new line of bar machines that gives these words a brand new meaning.

Take the new Model 45 4-spindle series. The spindle capacity of 5" puts much larger pieces within automatic high-speed bar machine production range. Cross slides in all positions greatly increase the number and variety of cuts possible on four spindles. Spindle speeds up to 526 RPM provide for the use of the latest cutting tools. At the other extreme is a new line of 8-spindle machines. As you would expect with New Britain's radial independent cross slides, you can apply a tremendous number of tools and attachments to get very high production on really complex pieces. Or, with a double indexing setup, you can turn out pieces, even pretty complex ones, at an all-time high rate per hour.

Six-spindle machines are everybody's work horses and New Britain offers the Model 52 in the 1¼" range, and the Model 62 with 2¾" capacity. These machines allow you to use a greater number and variety of tools on them without sacrificing accessibility. They can be tooled quickly and you can get at the tools for changes or adjustments with ease.

We can only suggest here some of the "show year improvements" in a greatly expanded line of New Britain bar machines. Your New Britain representative will be glad to arrange for a demonstration, and secure performance data based on your prints. If you would like to look over a catalog first, we'll be glad to send you complete descriptive literature. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Conn.



New Honeywell Flame Detector

not fooled by hot refractory or glowing carbon...

The ultimate in both safety and convenience, *Ultra-Vision Flame Detector responds *only* to ultraviolet—not to infrared**

Here's the *only* visual flame detector that can tell the difference between real flame and red-hot refractory or glowing carbon. It responds to nothing but the ultraviolet energy given off by flame and sparks, and can't be fooled. It cuts off fuel delivery on flame failure alone, and completely eliminates nuisance shutdowns.

Use the new *Ultra-Vision* Flame Detector to supervise gas-fired, oil-fired or oil-gas burners—it detects a flame from any type of fuel. This one unit keeps an eye on both the pilot and main flame. Use it with any standard rectification-type flame safeguard system, such as the *Protectoglo*. The *Ultra-Vision* sensor is easy to install, because it is insensitive to the refractory, and can be aimed at the flame from any convenient direction.

Now, for the first time, it's possible to have positive flame protection where protection formerly was difficult or impossible—in radiant cup burners and gas generators used to produce atmospheres for heat treating furnaces, for example.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone. Or write for Bulletin 95-2776.

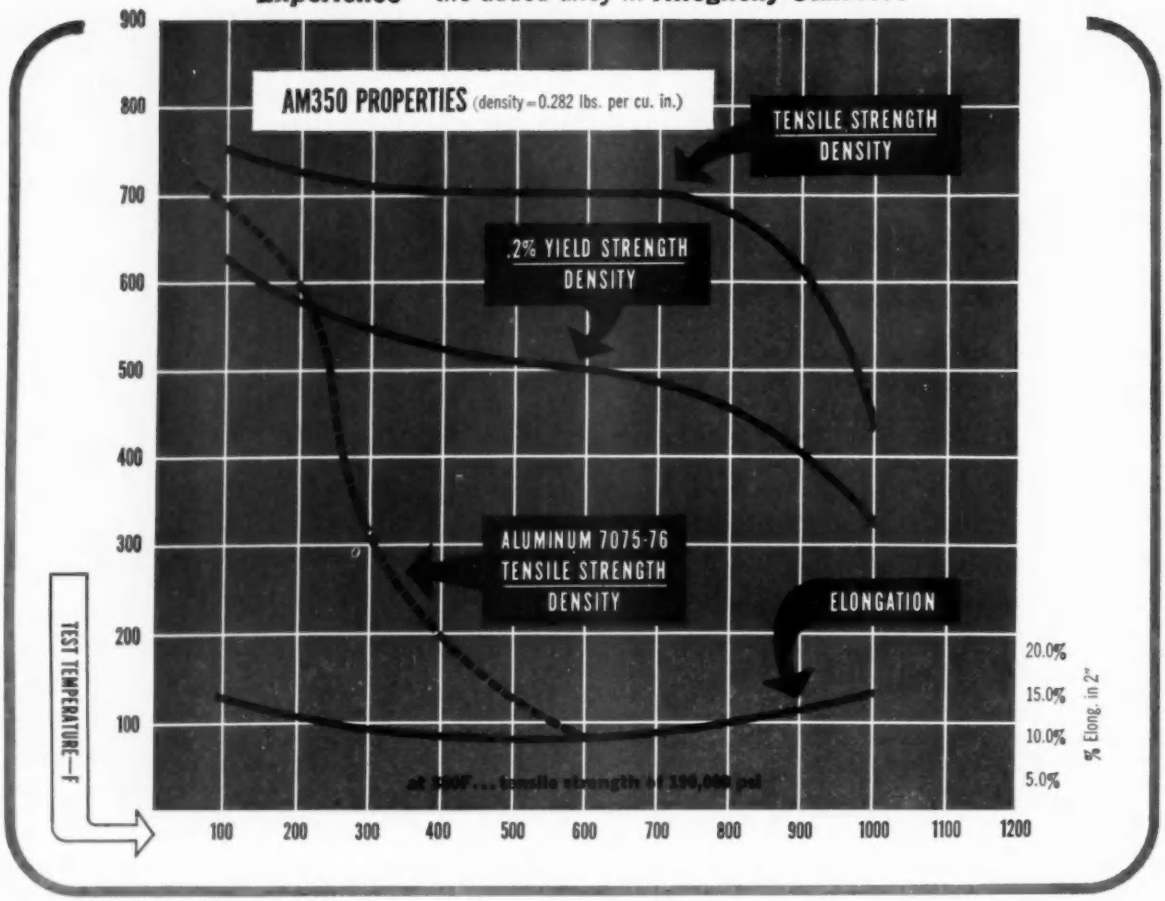
MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

*Trademark

Honeywell

H HONEYWELL First in Control

Experience *— the added alloy in* ***Allegheny Stainless***



Two for the space age—AL's AM-350 and AM-355 precipitation hardening steels

A unique combination of highly desirable properties describes Allegheny Stainless AM-350 and AM-355 Steels. They combine high strength at both room and elevated temperatures, excellent corrosion resistance, ease of fabrication, low temperature heat treatment, good resistance to stress corrosion.

They are proving the answer to many space age problems. Airframe and other structural parts, pressure tanks, power plant components, high pressure ducting, etc. are all natural missile and supersonic aircraft applications for AM-350 and AM-355.

AVAILABILITY: AM-350, introduced several years ago, is available commercially in sheet, strip, foil, small bars and wire. AM-355, best suited for heavier sections, is available commercially in forgings, forging billets, plates, bars and wire.

CORROSION RESISTANCE: Compared to the more familiar stainless grades, AM-350 and AM-355 resist corrosion and oxidation better than the hardenable grades (chromium martensitic) and only slightly less than the 18 and 8's. They resist stress corrosion at much higher strength levels than do martensitic stainless grades.

SIMPLE HEAT TREATMENT: High strength is developed by two methods. Both minimize oxidation and distortion problems. The usual is the Allegheny Ludlum-developed sub-zero cooling and tempering (SCT): minus 100F for 3 hrs plus 3 hrs at 850F. Alternate method is Double Aged (DA): 2 hrs at 1375F plus 2 hrs at 850F.

EASY FABRICATION: AM-350 and AM-355 can be spun, drawn, formed, machined and welded using normal stainless procedures. In the hardened conditions, some forming may be done . . . 180 degree bend over a 3T radius pin. Also AM-350 can be dimpled in the SCT condition to insure accurate fit-up.

For further information, see your A-L sales engineer or write for the booklet "Engineering Properties, AM-350 and AM-355." ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa. Address Dept. AI-19.***

WSW 7816

ALLEGHENY LUDLUM

Export distribution: AIRCO INTERNATIONAL

EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT

Circle 119 on Inquiry Card, for more data

STRICKLAND equips 78 new trucks... 50 new trailers...with WAGNER AIR BRAKES!

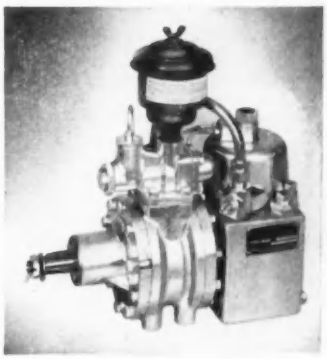
This fleet travels the equivalent of 3 times around the world every day!

Strickland Transportation Company of Dallas, with a fleet operation extending from New York City to San Antonio, knows that low maintenance for trucks and trailers means higher operating profit. Here's what L. R. Strickland, President, has to say about Wagner Air Brake Systems:

"Running an over-the-road truck fleet operation successfully depends greatly on getting the most out of the equipment you have. I specify parts and equipment on the basis of what will help lengthen the service life of these vehicles. I'm glad to tell you that when it comes to air brakes, I'll take Wagner every time. Our maintenance costs are more than satisfactory. One of the main things I like about the Wagner system is the Rotary Air Compressor. For my money it is the most efficient pump on the market."

"All-in-all, our experience and records show that Wagner Air Brakes are our best buy. I've just ordered 78 new trucks and 50 new trailers equipped with Wagner Air Brakes—what better recommendation can I give?"

Wagner Rotary Air Compressors, the only compressors that use the true rotary motion, are available in either 9 or 12 C.F.M. capacity, and in a drive-thru model for diesel-powered trucks.



Wagner Electric Corporation

6363 PLYMOUTH AVE. • ST. LOUIS 33, MO.

WK59-9

Circle 120 on Inquiry Card, for more data

Modern carburetors need the protection of new

PUROLATOR FUEL FILTERS

Particles of dirt only 10 microns in size are large enough to cause flooding or stalling in modern carburetors. Effective *positive* filtration is essential for delivering the clean fuel modern four-barreled carburetors must have for efficient operation.

Purolator's new Micronic® fuel filters are designed specifically for the requirements of modern carburation. They are compact, light-weight units with a positive type Micronic element sealed in a Terneplate steel housing.

The little unit shown measures only 2⅜" x 1⅝"—but packs 52 square inches of filtering area into a housing capacity of 4.5 cubic inches. The low-cost, easily replaceable unit gives completely effective filtration—and long life.

The Model GF-11 is already in use as original equipment on many engines. It is easily incorporated into any fuel line. For full specifications on the GF-11 and other Purolator fuel filters, write to Purolator.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

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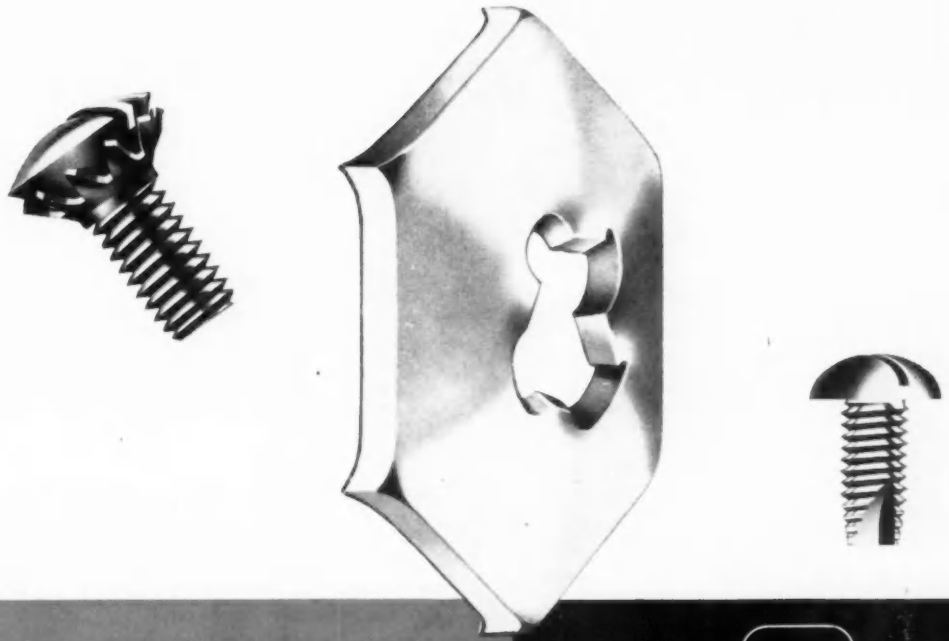
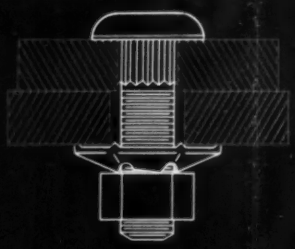


HOW TO SELECT COST-SAVING

fasteners for heavy duty applications



A TYPICAL EXAMPLE:
How to Fasten Securely to Avoid Shifting

Where considerable tension in the fastening is needed to keep the parts from shifting, the Shakeproof®-developed Pyramidal Lock Washer* should be used. This washer spans large clearance holes — provides tension needed to keep parts securely fastened and in alignment.

*U.S. Pat. No. 2,794,476

For want of the right fastener, man-hours and money are often needlessly lost! It's vital to economical assembly line production to specify fasteners for each application that will do a fast and effective job *every* time. Fasteners engineered by Shakeproof assure maximum locking, reduce handling, and provide many additional functions that save assembly time, reduce production costs and improve your product's quality.

SEND FOR NEW SHAKEPROOF BULLETIN NO. 200

Shows typical examples of money-saving fasteners developed by Shakeproof engineers for heavy metal applications. Offers testing samples. Write for your free copy today!

SHAKEPROOF
"FASTENING HEADQUARTERS"®
DIVISION OF ILLINOIS TOOL WORKS
St. Charles Road, Elgin, Illinois
In Canada: SHAKEPROOF/FASTEX
Division of Canada Illinois Tools Limited, 67 Scarsdale Road, Don Mills, Ontario

Circle 122 on Inquiry Card, for more data

Koenig rolls up 77,152 trouble-with a Spicer 5-speed

"OPERATION

Here's 77,152 miles of conclusive proof that Spicer transmissions are your best choice for economy, dependability, and top-flight performance.

SPECIFICATIONS

Ford T-950 Serial No. 8706-X

Delivered September 17, 1957

Rated GCW—75,000-lb.

Wheelbase—156-in.

Engine—534-cu. in. SD V-8

Transmission—5-speed Spicer 6352 with 3-speed Spicer 7231 Auxiliary

All the facts shown here as to the service history of the Ford T-950 truck serial No. 8706-X used in the Koenig Coal and Supply Company's operation are true, to the best of my knowledge and belief.

Grover Dowd

Maintenance Superintendent
Koenig Coal & Supply Company

FLORENCE M FOWLER NOTARY PUBLIC WAYNE COUNTY, MICH.

Florence M. Fowler

Florence M. Fowler
Notary Public
Wayne County, Michigan

free miles transmission during FORD'S

DURABILITY...

"Operation Durability" proved to be one of Ford's best-guarded secrets. In a daring test . . . launched months before the start of production . . . prototype models of Ford's new Super Duty Trucks were placed in the hands of leading fleets for use in normal day-to-day operations.

One of the vehicles, a Ford T-950 tandem, was put to workhorse duty hauling sand and gravel from Koenig's gravel plant at Oxford, Michigan to their concrete batching plants in Detroit.

This T-950, equipped with a Spicer 5-speed transmission and a Spicer 3-speed auxiliary transmission, has a rated GCW of 75,000 lbs. Yet it consistently pulled loads of 105,000 lbs. . . . even up to 120,000 lbs. . . . winter and summer, over hilly terrain, and through metropolitan Detroit's congested traffic.

In this dramatic demonstration of stamina and durability, the Spicer combination has logged 77,152 miles . . . without one bit of downtime in over 18 months. This record performance is verified by the sworn statements of Koenig's fleet superintendent, as well as the Ford engineers who supervised the project. For, in this truly authentic test, no mechanic was allowed to replace even a bolt without reporting it to the Ford engineers.

DANA Spicer

DANA CORPORATION

Toledo 1, Ohio

Serving Transportation—Transmissions • Auxiliaries • Universal Joints • Clutches • Propeller Shafts • Power Take-Offs • Torque Converters • Axles • Powr-Lok Differentials • Gear Boxes • Forgings • Stampings • Frames • Railway Drives

Many of these products are manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario

Dynex, Inc., Pewaukee, Wisconsin, produces single- and double-acting cylinders from Republic ELECTRUNITE Special Smooth I.D. Hydraulic Cylinder Tubing.

Republic ELECTRUNITE Tubing...

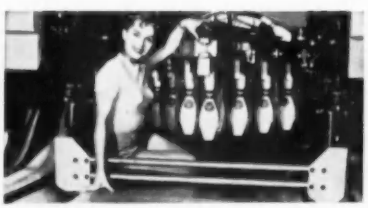
OFFERS MORE TUBE PER DOLLAR

Dynex, Inc., Pewaukee, Wisconsin, has switched to Republic ELECTRUNITE® Special Smooth I.D. Hydraulic Cylinder Tubing in their manufacturing operations. The switch was made because ELECTRUNITE's special smooth, micro-inch inside finish eliminated costly honing, resulting in a better end product at a lower unit cost. Typical example of how ELECTRUNITE is providing thousands of manufacturers and fabricators with "more tube per dollar."

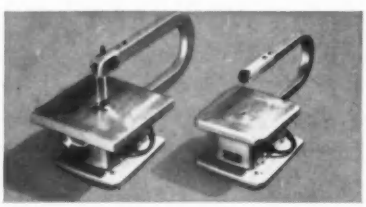
ELECTRUNITE, produced by the world's largest manufacturer of electrically welded tubing, is made from highest quality flat-rolled steel, carefully controlled through every step of manufacturing.

ELECTRUNITE Special Smooth I.D. Hydraulic Cylinder Tube is available in sizes up to 4½" O.D. in walls up to .187". ELECTRUNITE Mechanical Tubing is available in round sizes up to 6" O.D. and squares and rectangles up to periferies of 20 inches. Wide range of wall thicknesses, some up to .250" wall.

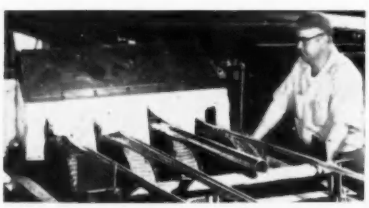
Call your Republic representative to see how ELECTRUNITE can offer you "more tube per dollar", too. Or, write direct.



AMF CUTS COSTS, builds a better pinspotter with Republic ELECTRUNITE Mechanical Tubing. Saved $34,000 in boring, grinding, and material costs.



SAVINGS IN TIME AND MATERIALS by Syncro Corporation, Oxford, Michigan, by using ELECTRUNITE Square and Rectangular Tubing for blade-yokes.



GET REPUBLIC ELECTRUNITE Stainless Steel Tubing in sizes from ¼" through 5" O.D. Bright annealed finish available in sizes up to 4" O.D.

REPUBLIC NYLOK® FASTENERS hold securely even under shocks of rotary cultivation. Gravely Tractors, Inc., Dunbar, West Virginia, found Republic NYLOK Studs gave long, dependable service under the constant shocks and pounding of rotary cultivating. Republic NYLOK Fasteners have a special nylon insert that assures positive locking at any position, even under severe shock, vibration, or tension. The resilient nylon exerts pressure and prevents play, for maximum holding power. Write today. Use coupon below.

REPUBLIC ENDURO® STAINLESS STEEL provides uniform quality. Tuttle and Kift Division, Ferro Corporation, Chicago, Illinois, manufactures a large share of all assembled electric range heating elements produced. They find they can depend on Republic Stainless Steel to meet the rigorous standards they demand. They find the quality is consistent. They like Republic's excellent metallurgical and delivery services. To learn more about the advantages of stainless steel, call your Republic Sales Office, or mail coupon.

REPUBLIC COLD DRAWN SPECIAL SECTIONS lower costs, improve quality, increase production. Because they are formed to the predominating cross-section of the part, Republic Cold Drawn Special Sections eliminate or greatly reduce required machining. Results are faster output and lower cost. Since cold drawing improves the physical properties of any given analysis, completed parts are stronger and longer wearing. Other advantages are improved appearance and simplified design. Send for data.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. AI-7973-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following products:

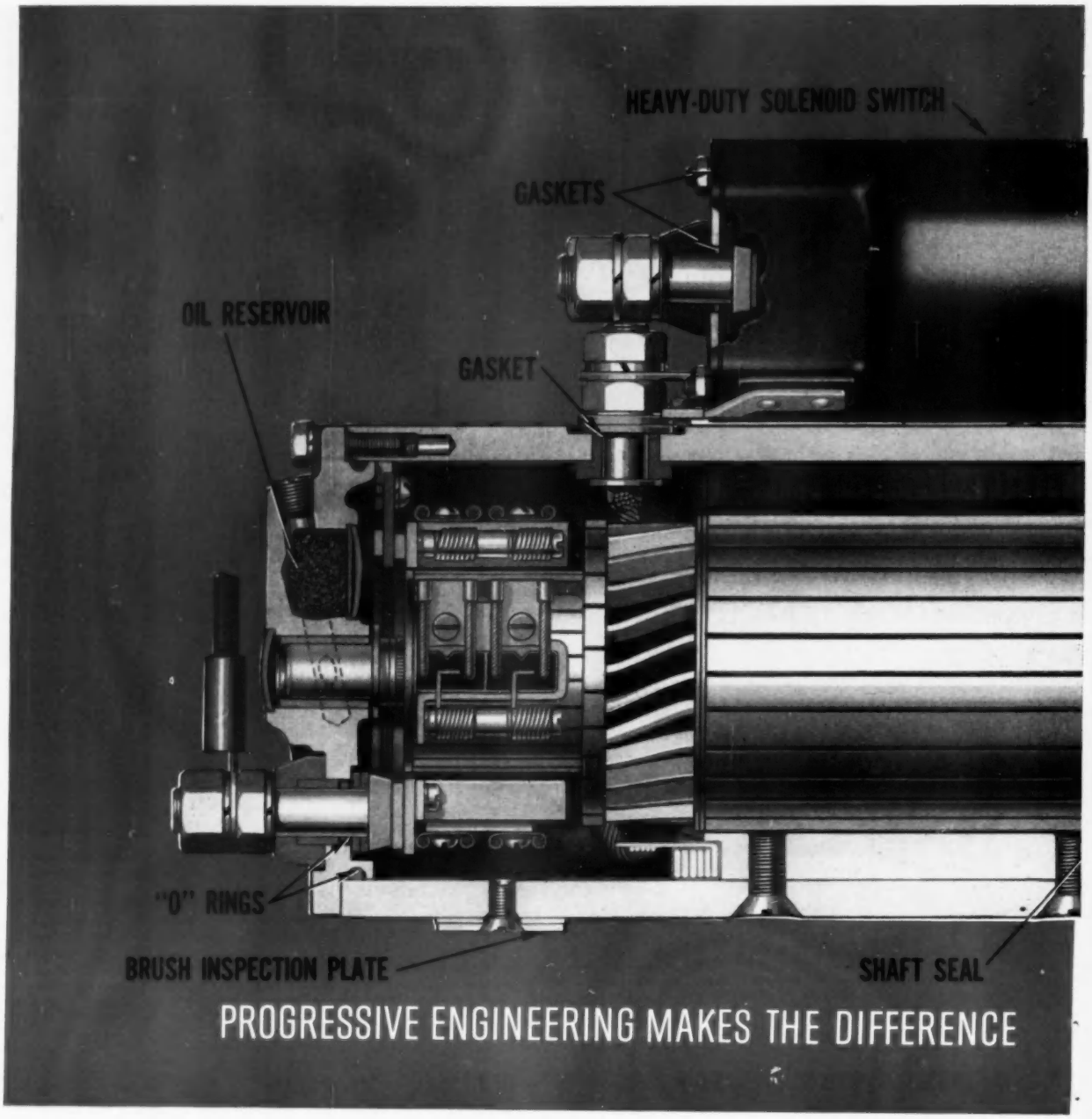
- ☐ ELECTRUNITE Hydraulic Cylinder Tubing
- ☐ Line Tubing
- ☐ Mechanical Tubing
- ☐ Stainless Steel Tubing
- ☐ NYLOK Fasteners
- ☐ Republic ENDURO
- ☐ Republic Cold Drawn Special Sections

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

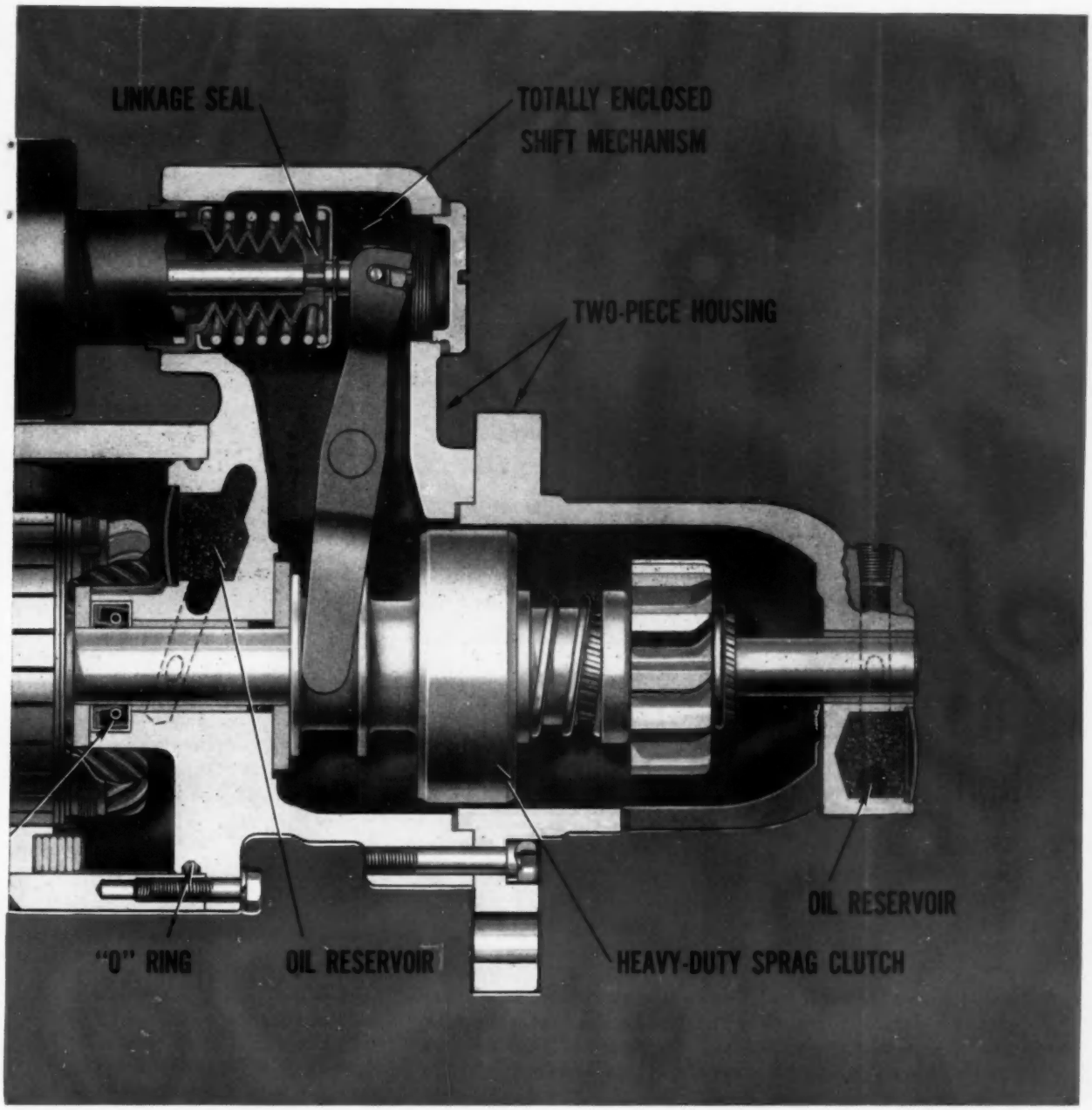


NOW FROM DELCO-REMY——NEW TOTALLY

Delco-Remy now offers a completely new series of solenoid-operated, over-running clutch type heavy-duty cranking motors with the shift mechanism entirely enclosed. Special two-piece drive housings can be assembled to permit a total of 24 different solenoid positions with respect to motor mounting. New 50% longer brushes, together with sealing rings (optional) and large oil reservoirs (optional), assure extra-long operating time between overhauls. And Delco-Remy design features keep these heavy-duty cranking motors positively engaged until the engine starts. Engine manufacturers are invited to write directly to Delco-Remy for complete information and engineering assistance on the application of these new motors.

TOTALLY ENCLOSED DRIVE SHIFTING MECHANISM is protected against dirt, water, slush and ice. This enclosure plus the shaft seal and linkage seal also prevents transmission oil leakage.

TWO-PIECE DRIVE HOUSING DESIGN permits 24 different solenoid positions. Nose housings available in S.A.E. #2 and #3 mountings.



ENCLOSED HEAVY-DUTY CRANKING MOTORS

HEAVY-DUTY SOLENOID AND SWITCH provide positive pinion engagement and safely handle maximum starting current. Special seals increase contact life.

SPRAG CLUTCH DRIVE operates with non-chamfered ring gear. Pinion indexes on spiral spline, positively engages ring gear before power switches on, and does not become disengaged with sporadic engine firing.

HEAVIER BRUSH INSPECTION PLATES resist damage from use and handling—are sealed to prevent leakage to motor interior.

GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

GM GENERAL MOTORS

ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

Circle 125 on Inquiry Card, for more data

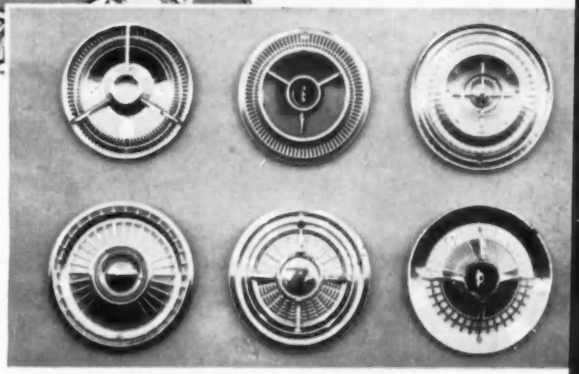
Brightness is Not Enough

Wheel covers must be more than just bright. They must have strength, spring temper, durability and low unit cost in volume production.

Other materials may claim some of these characteristics, but only stainless steel actually possesses all of them — and has a performance record to prove it.

It is easy to **make cheaper wheel covers.** Just forget that customer complaints, lost goodwill and the inevitable replacement of parts eventually show up on the balance sheet.

In wheel covers there is no substitute for stainless steel's lasting brightness, strength and durability.



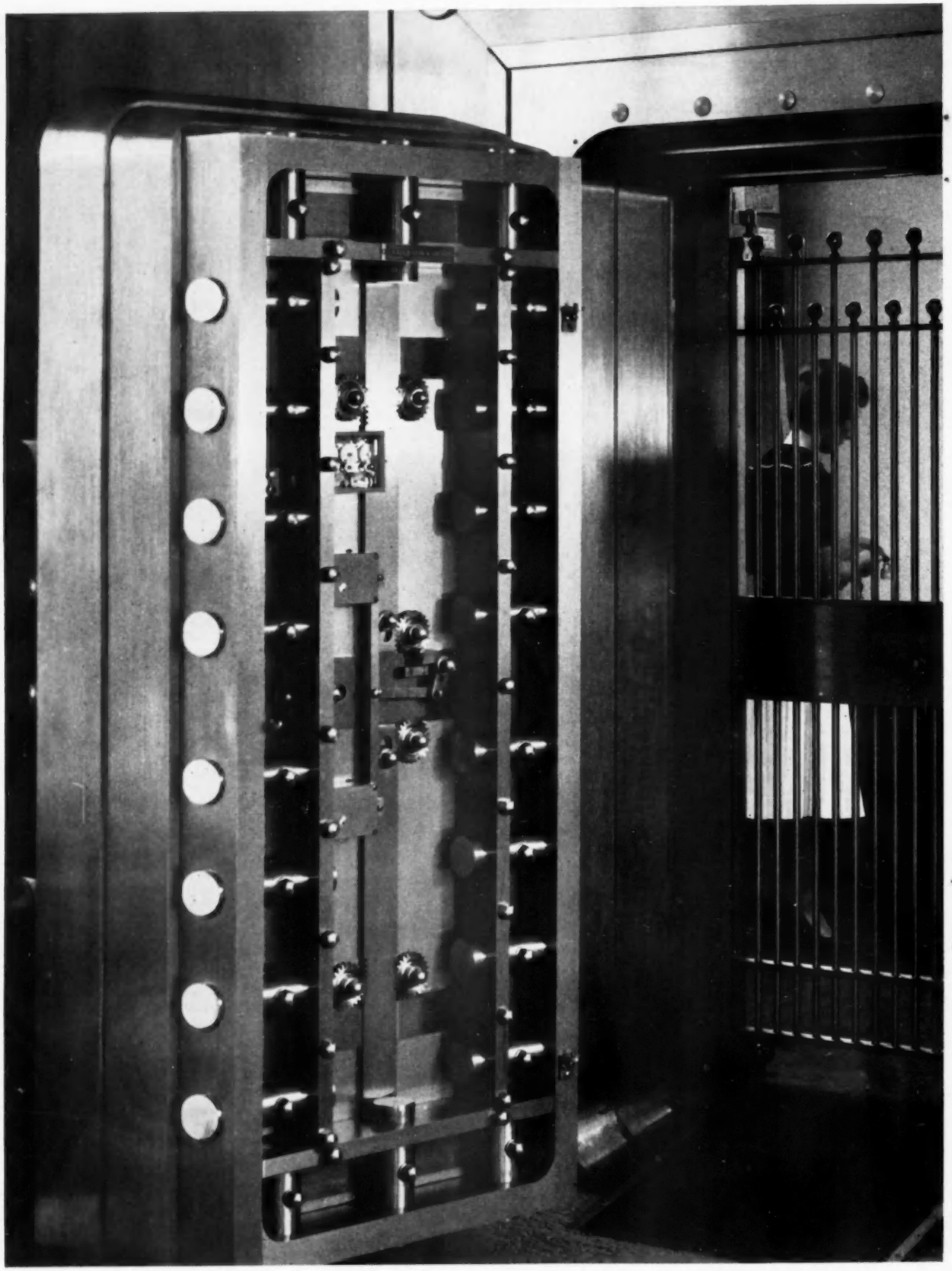
Can you name the cars represented by these stainless steel wheel covers? A postcard request will bring you the answers.

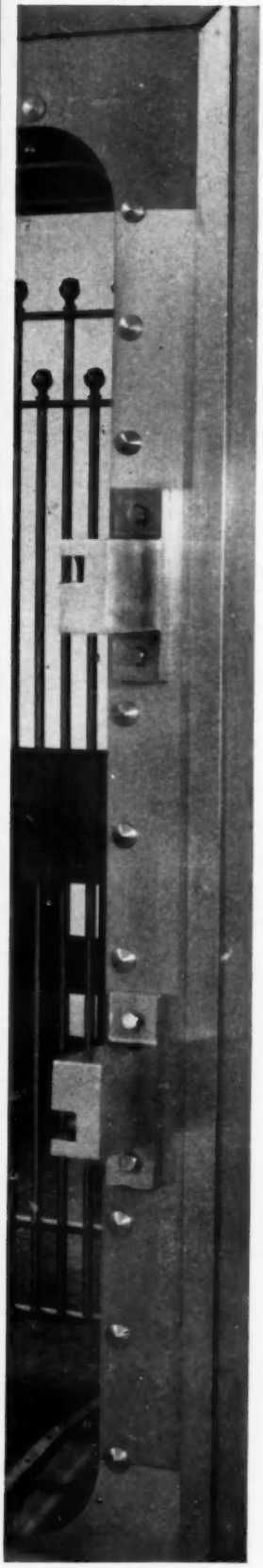
STAINLESS

SHEET • STRIP • BAR • WIRE

Plants and Service Centers:
Los Angeles • Kenilworth (N. J.) • Youngstown • Louisville (Ohio) • Indianapolis • Detroit

Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34



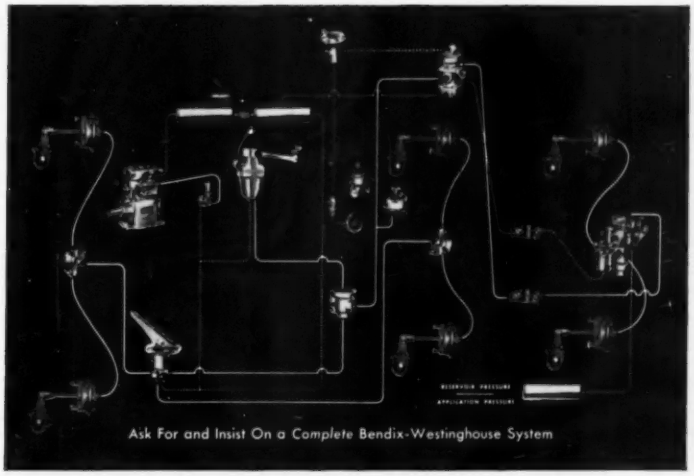


Dependable systems demand systems planning and engineering

When safety and security are at stake, only a completely integrated system of components working together assures maximum reliability. The need for this kind of *system* performance applies to air brakes as much as to a bank vault with its precise tolerances and split-second, time-locking devices.

The efficiency of both systems depends on the close interrelation of all components or devices. By assembling individual components from many sources, you *might* build a workable bank vault or air brake system; but for maximum security and reliability, it's always to your advantage to specify a *complete chain* of system-engineered components—designed, engineered, and assembled to *work together*.

That's why more manufacturers specify the *complete* Bendix-Westinghouse Air Brake System for their vehicles. Fleet operators, too, know that Bendix-Westinghouse Air Brakes give top performance for a longer period at lower over-all cost. And Bendix-Westinghouse accepts full and complete responsibility for the proper functioning of the system. Proof? More vehicles travel more miles with Bendix-Westinghouse Air Brakes than with all other air brakes combined.



Ask For and Insist On a *Complete* Bendix-Westinghouse System

SYSTEM—according to Webster: "Many parts connected in such a manner as to create a chain of mutual dependencies"

Bendix-Westinghouse

AUTOMOTIVE AIR BRAKE COMPANY

General offices and factory—Elyria, Ohio. Branches—Berkeley, Calif. and Oklahoma City, Okla.

New! Polyken #640 paper, pressure sensitive, flat back designed for precision line masking and sealing.

NOW! 5 NEW POLYKEN® PAPER TAPES!

Now—with the addition of two crepe back and three flat-back tapes—Polyken offers a complete line of paper tapes.

These are available along with Polyken #620, the famous all-around high-utility tape for sealing, masking, bundling and packaging. This means you no longer need search among several suppliers to get the tapes you need. Polyken has them all.

And now, too, you can group your Polyken paper-back tapes with other Polyken product purchases for full quantity discounts.

Polyken's half century of research and service assures you the finest quality tapes available, anywhere.

Polyken representatives are the industry's best trained technicians in the use and application of industrial tapes. They are ready to assist you, any time. Check with the Polyken Industrial Tape Distributor nearest you. Look in the phone book under "Tapes," or write to Polyken Sales Division, 309 W. Jackson Blvd., Chicago 6, Illinois. (In Canada, write Polyken, Curity Ave., Toronto.)

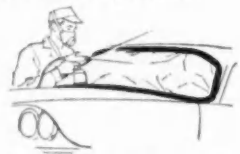
Polyken®

INDUSTRIAL TAPES

THE KENDALL COMPANY
Polyken Sales Division

New! Polyken #643, flat-back tape, printable. For packaging or sealing where identification is required or helpful.

New! Polyken #641, high strength flat-back. For heavy duty holding and sealing applications, and for strapping.

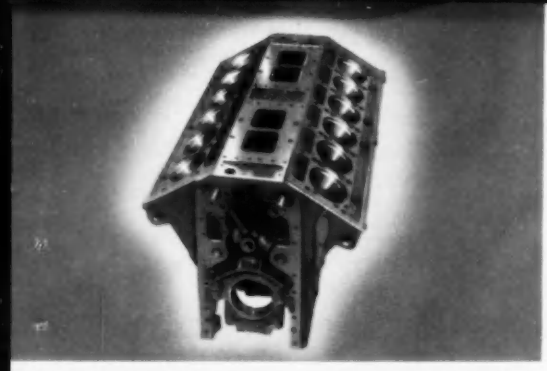


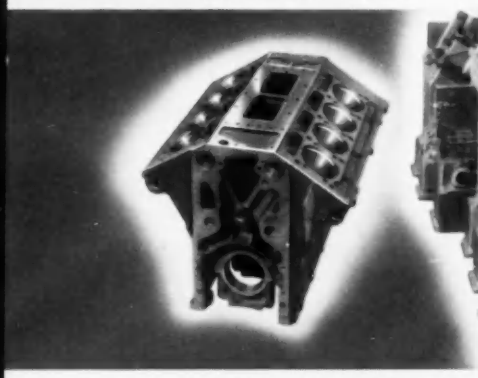
New! Polyken #621, crepe-back, high-temperature. For masking or sealing prior to high temperature baking or drying.

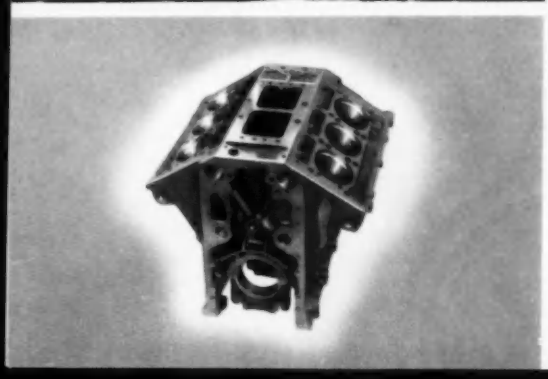
New! Polyken #622 stain resistant. For use on surfaces where discoloration is possible. Ideal for holding in shipment.

Circle 129 on Inquiry Card, for more data

Circle 130 on Inquiry Card, for more data

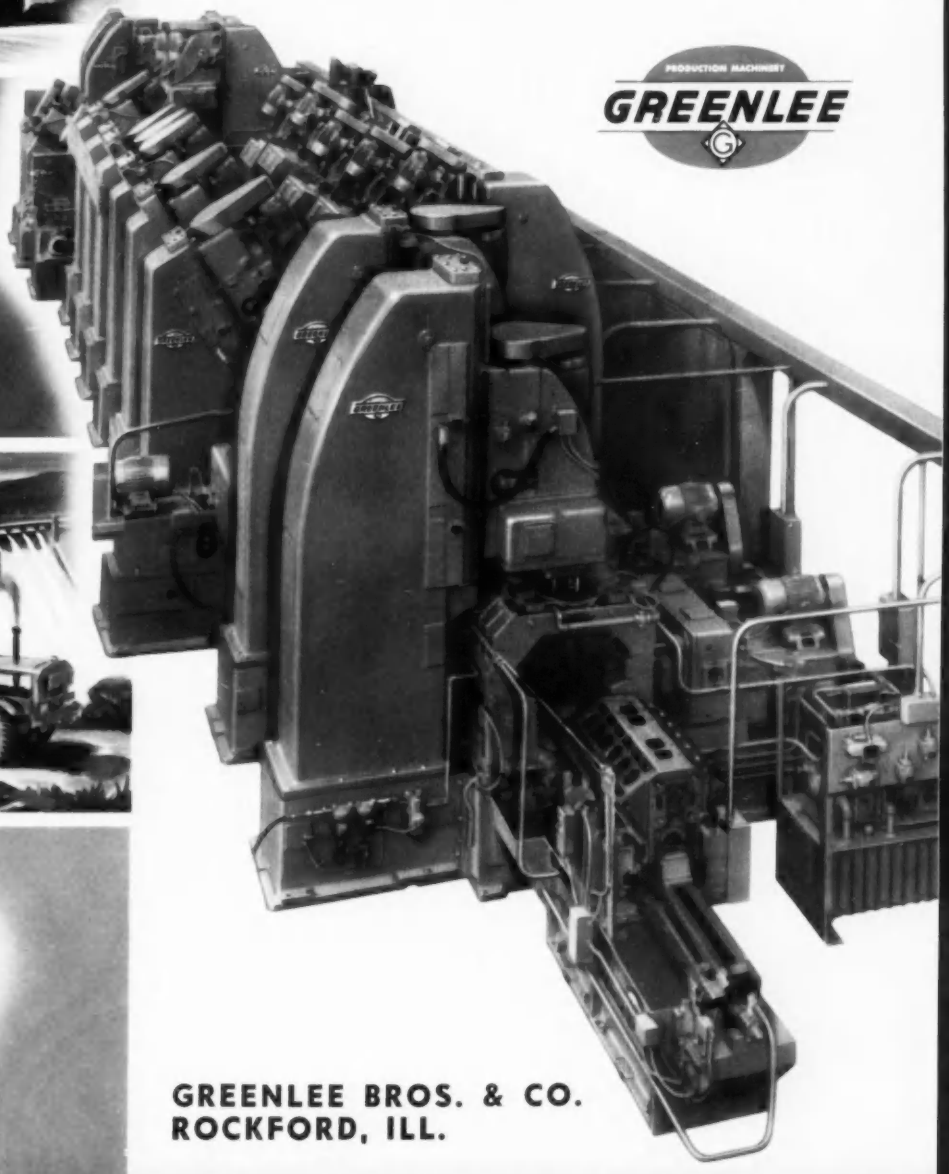






V-type Diesel engine blocks in three different sizes now processed on the same

GREENLEE TRANSFER MACHINES

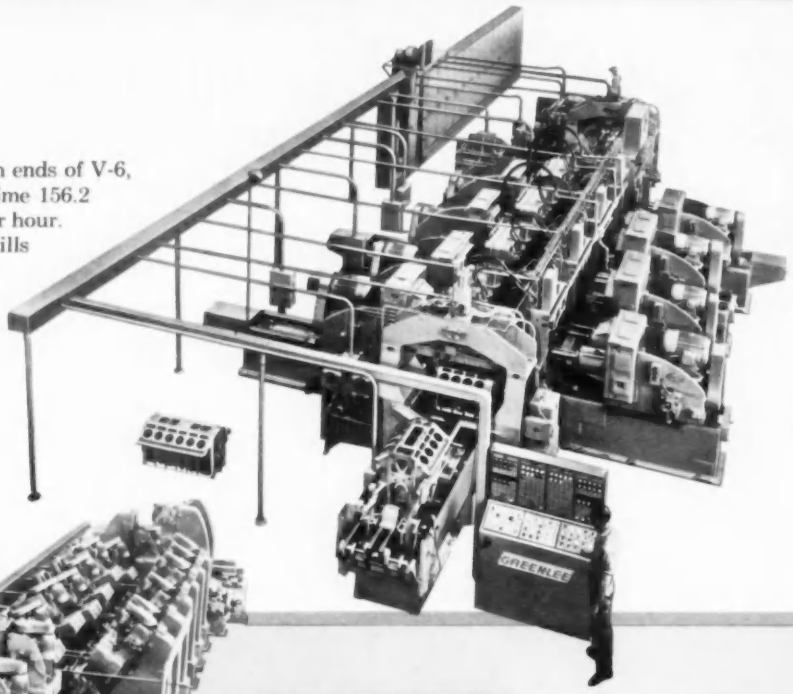


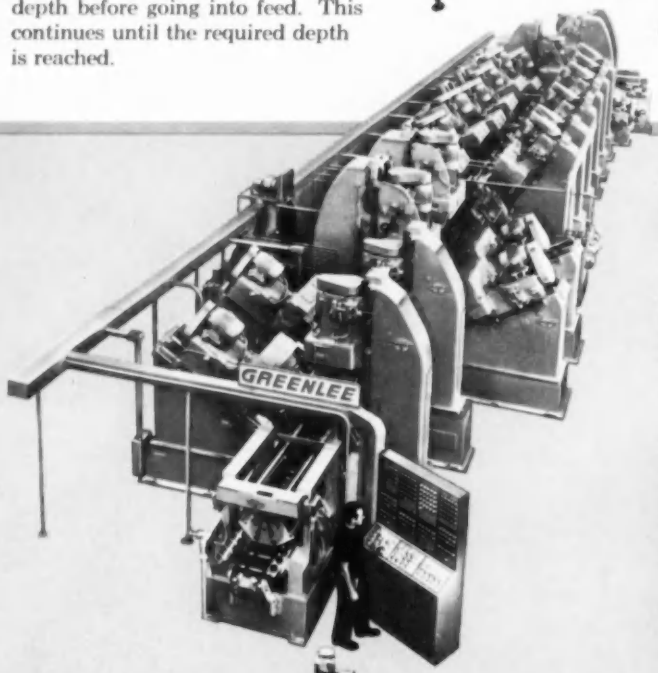
PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
ROCKFORD, ILL.

MACHINE NO. 1

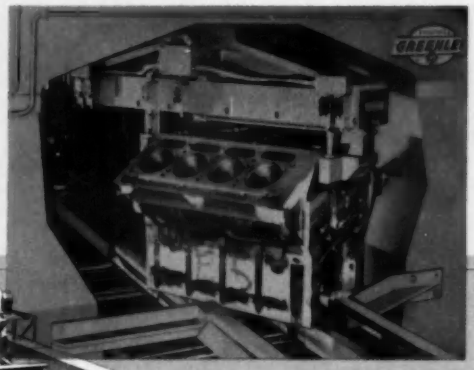
9 stations. 42 feet long. Machines both ends of V-6, V-8 and V-12 cylinder blocks. Cycle time 156.2 seconds. Gross production 23 pieces per hour. Rough bores cam and crank holes. Drills 3 oil galley holes 11 to 18 inches deep. Drills holes for tapping operations. Block is turned 90° in the second station. Heads for deep hole drilling have step feed (jumping jack) action, that is, the drills are fed to a certain depth and then retracted to remove chips. Successive passes rapid-approach to the last drilled depth before going into feed. This continues until the required depth is reached.



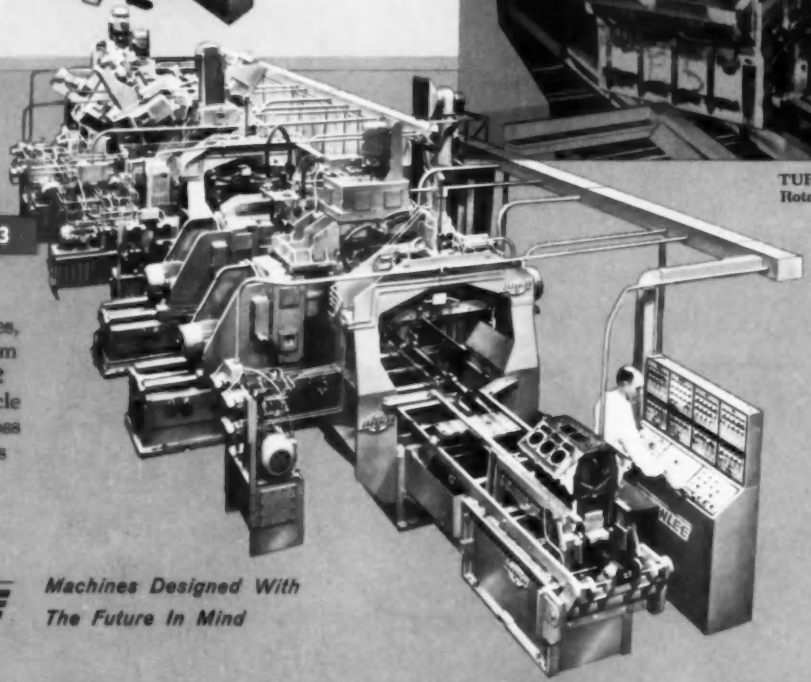


MACHINE NO. 2

16 stations. 104 feet long. Machines top, bottom, sides and banks of V-6, V-8 and V-12 cylinder blocks. Cycle time 144 seconds. Gross production 25 pieces per hour.



TURN STATION
Rotates Block 90°

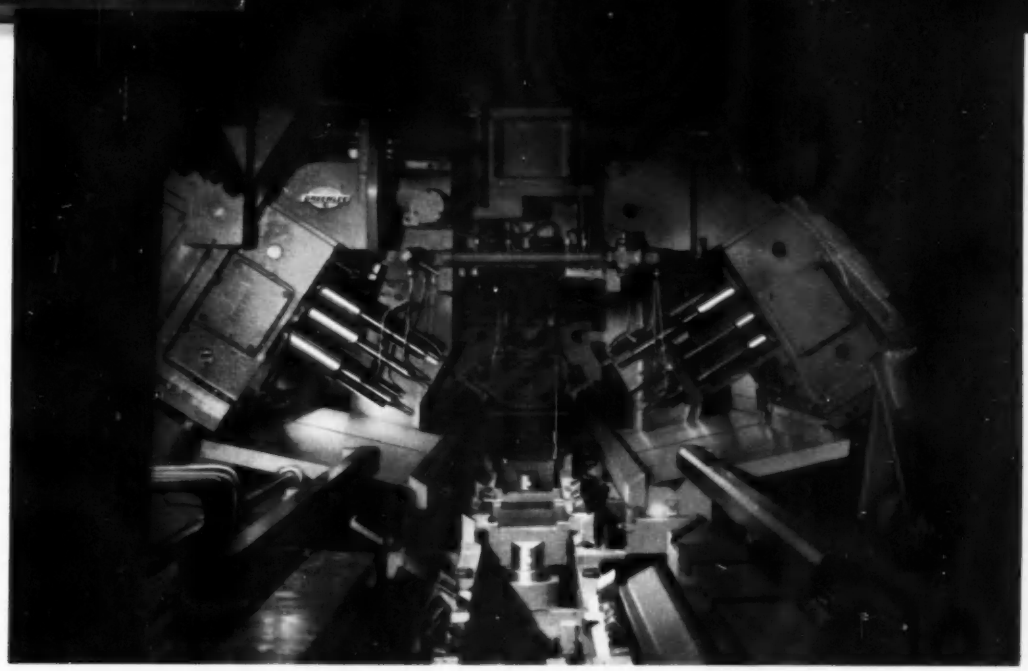


MACHINE NO. 3

11 stations. 64 feet long. Taps ends, sides, banks, top and bottom of V-6, V-8 and V-12 cylinder blocks. Cycle time 35 seconds. Gross production 104 pieces per hour.

PRODUCTION MACHINES
GREENLEE

Machines Designed With The Future In Mind



Planned for quick, easy changeovers

A leading manufacturer of diesel engines now includes V-type models in its newly expanded line. In the early stages of planning for production, Greenlee representatives were called in. The problem was not a simple one. Although production rates would not be high — all three cylinder blocks for V-6, V-8 and V-12 engines would have to be processed on the same machines. Changeover time from processing one size block to another must be held to a minimum.

COOPERATION IN DESIGN

To help attain the necessary flexibility, the customer's engineers did an exceptionally good job of designing the blocks for interchangeable processing. Each cylinder, for example, has its own pattern of holes and bearings to permit easy changeover. Components were standardized wherever possible. Greenlee engineers working in close cooperation were able to take full advantage of this flexibility in design to provide further flexibility in machining. Lower initial cost and greater production economies resulted.

MACHINE CHANGES SIZE

When processing the ends of blocks in each of three sizes, the fixture frame and machining heads must be moved to accommodate increased or decreased length of block. A lever pulls the locating pin at each station. When all pins are pulled a push button is pressed and the adjustable part of the machine, together with the transfer bar on that side, moves to its new position. Locating pins accurately position the fixture side frame in its new location.

DOWEL SELECTION

The selection of the proper locating dowel in each station for each size block is controlled by a series of levers. The machines are automatically controlled to operate only when all the levers are set for the same size block.

TOOL CHARTS

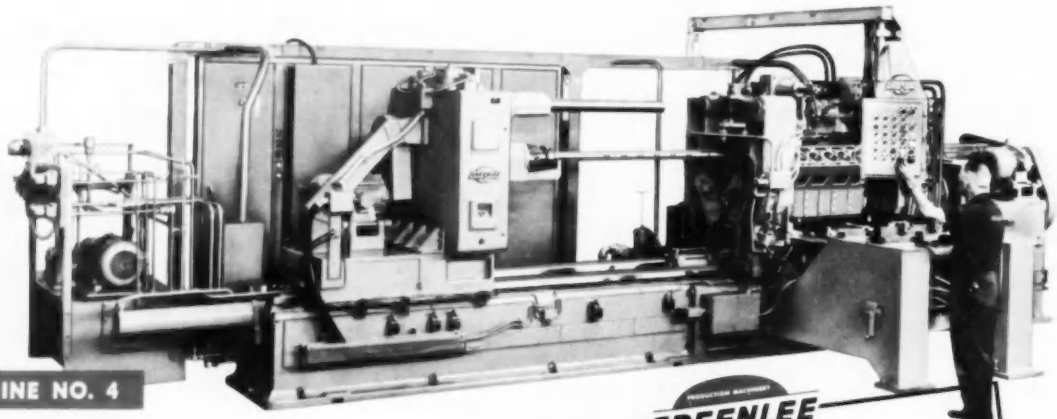
The correct tools and set-up for each size block are readily determined by following the tool charts and changeover check lists supplied with the machines. These charts help reduce changeover time and minimize the possibility of error.

FLEXIBILITY OF OPERATION

These machines were designed to process both cast iron and aluminum blocks. The ease with which they can be changed over from cast iron to aluminum machining demonstrates their extreme flexibility. Variable feed rates and ease of tool change make it possible to change from machining cast iron to machining aluminum in a minimum of down time.

HANDLING

A walking-beam type transfer mechanism is used to carry the blocks from station to station. The blocks are *carried*, not *skidded* through all five machines. Machine No. 1 has two turn stations, rotating 90°. Machine No. 2 has one 180° turnover station. Machine No. 3 has two turn stations rotating 90°, and one 180° turnover station. These 90° rotating stations are designed to handle the three different sizes of blocks without adjustment. The 180° turnover stations are manually adjusted in seconds to accommodate any of the three block sizes.



MACHINE NO. 4

Two-way horizontal machine automatically semi-finish bores cam holes, and finish cross-faces rear thrust bearing. Cycle time 103 seconds. Gross production 35 pieces per hour.

The sequence of operations automatically performed on this machine is as follows:

(1) Block is conveyed to machining position.

(2) Block is positioned to receive boring bar.

(3) Boring bar is advanced.

(4) Block is located for the boring cut.

(5) Boring bar is rotated and fed on the return stroke. This results in a pulling action keeping the bar in tension and eliminating vibration.

(6) After boring operation is completed, bar is positioned radially, block is positioned and bar is withdrawn.

(7) Block is removed from machine.

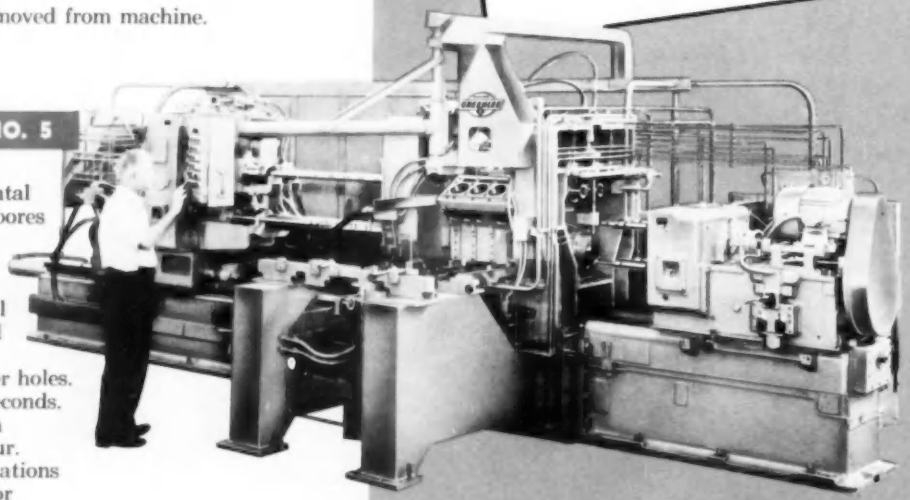
GREENLEE

FACILITIES and EXPERIENCE

(1) Greenlee plant facilities are large enough to erect a complete line and conduct test runs with coolant supplied from a central system built into the assembly floor.

(2) Greenlee controls every step in the manufacture of the machines which it produces. Engineering, foundries, machine shops, assembly floors are all centralized in Rockford.

(3) Greenlee has the experience and proven ability to build successful transfer machines . . . is considered one of the pioneers in the field of mechanized production.



MACHINE NO. 5

Two-way horizontal machine finish bores cam holes. Finish bores crank bore. Reams two dowel holes in each end of block. Finish counterbores idler holes. Cycle time 131 seconds. Gross production 27 pieces per hour. Sequence of operations is the same as for Machine No. 4.

GREENLEE BROS. & CO.

1811 MASON AVE.
ROCKFORD, ILLINOIS

Printed in U.S.A.

NEWS

Vol. 121, No. 2 July 15, 1959

Front or Rear Engine?

Big Three Can't Agree on Where to Put Small Car Power Plant

The "battle of the small cars" is turning into a battle over engine location. All of the Big Three have entered the fray.

The basic issue is: where to put the engine? Chrysler and Ford say it should go in the front, where it historically has been on most American cars. Chevrolet says it's all right to put the engine in the rear, as long as the car and the engine are properly designed and built. And that's just where Chevrolet is going to put the powerplant in its 108-in. wheelbase Corvair, although no one at Chevrolet is ready to admit it.

Chrysler and Ford have been taking pot shots at Corvair, without any actual name-calling. Chrysler president L. L. Colbert has been repeating for some time that its small car will have the engine "in the front, where it belongs." And now, Simca, the Chrysler import, has launched a national advertising campaign that pulls no punches in labeling rear engine cars unstable, hard to handle, even dangerous.

Simca Broadside

Simca is concerned more with Volkswagen, Renault and Fiat than it is with the relatively larger Corvair. Because of the size and price, these are Simca's chief competition in this country. But a little of the Simca broadside is expected to rub off on Corvair and help Chrysler's Valiant, which is more in the Corvair class.

Simca, in fact, refers to "two leading economy imports with rear-placed engines" in its campaign.

Ford has been using television to point out the difference in accuracy between a rear-weighted and a front-weighted arrow. The comparison is transferred to automobiles, again without mentioning names, but pointing out that Ford has front-engine cars.

Chevrolet officials called a hurry-up press conference in Detroit recently to talk about the design characteristics of a "hypothetical rear-engine compact car."

Maurice Olley, former director of research and development for the division, came out of retirement to handle the meeting.

The meeting served two purposes. It "cleared the air," as one spokesman put it, of some "misunderstandings" that had arisen as a result of competitive advertising. And it confirmed, although tacitly, that Corvair will have its engine in the rear and its gasoline tank in the front, although the name of the car never was mentioned.

Basic Differences

Chevrolet pointed out that there are some basic differences between the Corvair and other rear-engine cars that make a true comparison difficult. Corvair is a larger and longer wheelbase car, using a lightweight (for its size and power) engine. Corvair probably will have a low pivot swing axle to give it greater stability. Chevrolet engineers are planning a 10 lb difference in front and rear tire pressures, with only 15 or 16 lb. in front. A new, long-cord, low-profile tire is planned. Weight distribution will be an extreme 40/60, with better braking and acceleration claimed by Chevrolet for the rear-heavy car.

In short, according to one Chevrolet official, many of the existing criticisms of small rear engine cars will not apply to the all-new Corvair. But the barbs seemed to be having some effect to get Chevrolet to break its severe silence.

Pontiac's Magi-Cruise

Pontiac introduced a new throttle control called Magi-Cruise. The unit, when set, retains a constant accelerator position, enabling the driver to remove his foot. Brake application releases the Magi-Cruise, and the pre-selected speed can be overridden by the accelerator pedal for bursts of speed.

Six-passenger **Wolseley has 18 cu ft of luggage space.**

Wolsely 6/99 Gets Farina Styling

Wolseley 6/99 is the first of the British Motor Corp.'s larger cars to get the Farina styling treatment already featured on several smaller models in its range.

The unitary body seats six adults. The trunk, with spare wheel stowed on an underslung tray, provides 18 cu ft of luggage space. The six-cylinder engine displaces 177.7 cu in., has an 8.23 compression, and develops 112 bhp at 4750 rpm. Three-speed gearbox includes an overdrive unit that operates on the two top ratios as standard equipment. An automatic transmission is available as an option.

New 7 in. Headlamp

A new headlamp, designated the Seven-Inch Type Two Headlamp, has been developed for original equipment use and replacement in the 60 million or so cars not equipped with the 5¾ in. diameter dual headlamps.

Type two provides better light distribution, improved illumination on the right side of the road, and deeper fog and rain penetration, according to the Automobile Manufacturers Association.

The new lamp was developed by lamp and vehicle manufacturers in cooperation with the American Association of Motor Vehicle Administrators. Type Two is approximately as good as the dual headlamp system on low beam, but not as good on high beam. But the AMA points out that up to 90 per cent of all night driving is on low beam.

In addition to replacement for cars equipped with seven in. lamps, the new unit is expected to find wide use in trucks, Lark and Rambler American passenger cars, and imported vehicles. Foreign cars must be equipped with sealed beams to be sold in this country.

Dodge Accessories

Dodge reports a 50 per cent jump in air conditioning orders in 1959, and a 159 per cent boost over 1958 in tinted glass installations. In the '59 model year, Dodge installation of automatic transmissions has been running at 94 per cent; power steering, 67 per cent; radios, 53 per cent; back-up lights, 80 per cent; heaters, 98 per cent; and windshield washers, 40 per cent.

Model Changeovers

Production of 1959 models was halted at Imperial Div. on July 1. Other Chrysler Corp. lines were slated to shut down before the end of July.

Chrysler plants will be closed for model changeover longer than normal — about five weeks — because of plant changes involved in switching to unitized construction for all but Imperial.

GM plants are expected to begin changeover the first week of August. Ford will shut down its Lincoln and Thunderbird lines within a month, and Ford, Edsel, and Mercury by the end of August.

Car production figures for the six-month period ending June follow:

NEW CAR PRODUCTION
Six-Month Period

	6 Mos. '59	6 Mos. '58	June '59	June '58
AMERICAN MOTORS	216,803	92,812	37,837	18,281
CHRYSLER CORP.				
PLYMOUTH	255,005	202,372	50,101	35,483
DODGE	96,943	56,141	17,555	11,462
DE SOTO	31,132	19,867	5,170	3,999
CHRYSLER	44,813	30,235	8,651	4,630
IMPERIAL	11,866	9,618	1,894	716
TOTAL CHRYSLER	439,759	316,243	83,371	56,290
FORD MOTOR CO.				
FORD	826,215	504,975	142,988	71,043
EDSEL	23,299	6,944	2,575	496
MERCURY	82,744	64,262	12,787	9,151
LINCOLN	15,897	14,833	1,738	1,409
TOTAL FORD CARS	948,155	591,014	160,088	62,099
GENERAL MOTORS CORP.				
CHEVROLET	885,546	712,494	147,513	111,371
PONTIAC	247,643	120,185	46,672	13,997
OLDSMOBILE	226,029	179,386	37,495	23,829
BUICK	141,590	133,111	18,392	16,183
CADILLAC	89,444	77,051	14,920	11,606
TOTAL GENERAL MOTORS	1,590,252	1,222,227	264,992	176,986
STUDEBAKER-PACKARD	89,068	20,060	11,727	3,790
U. S. TOTAL INDUSTRY	3,284,037	2,242,356	558,015	337,446

Saginaw to Expand

Saginaw Steering Div. of General Motors is planning a "multi-million-dollar" expansion program that will add 236,000 sq. ft. of manufacturing space at plant 4 in Saginaw. W. H. Doerfner, division general manager, said the program will more than double the plant's facilities and add 800 jobs. "Increased business demands and anticipated new business" are given as reasons for the Saginaw project.

Reynolds Pouring Metal

Reynolds Metals has begun pouring molten aluminum for Chevrolet at the new Reynolds' reduction plant in Massena, N. Y. Eventually Chevrolet's neighboring foundry will take approximately one-third of the Reynolds' Massena output.

Start-up of the first of three pot lines in mid-July added 33,000 tons to Reynolds' annual capacity. Two more lines, with an additional 67,000 tons, will be in operation at Massena before the end of the year, bringing the company's total capacity to 701,000 tons.

Earlier this year, Reynolds began deliveries of aluminum ingot to the Chevrolet foundry for preproduction test pourings. With the opening of the pot line this month, Reynolds is delivering molten metal at 1780 deg for direct casting at the Chevrolet plant.

Chevrolet will cast engine blocks, transmission housings, pistons and other parts for its new Corvair air-cooled, flat six-cylinder engine at Massena.

30,000 Spark Plugs

AC Spark Plug's automotive model shop hand assembles some 30,000 spark plugs, with 1000 different variations, every year. The plugs carry minute differences in insulators, shells, center wires, side wires and combinations. The objective, according to AC, is to provide a slightly different heat range to meet engineers' needs for a particular engine specification. The experimental plugs are all operational, not merely models.

Buick Convertibles Up

Buick reports its convertible sales already are more than double the total for all of 1958. A year ago only 5764 soft tops were sold, but by the end of June, Buick had delivered some 12,000. Convertibles are accounting for more than 11 per cent of the division's total sales.

Allis-Chalmers D-12 wheel tractor with a 4-cylinder 138-cu in. Power Crater engine. Tractor is also available in a "high clearance" model.

A-C Adds Two Tractors to "D" Series

Allis-Chalmers Mfg. Co. has added two new farm tractors to the "D" series built by its Farm Equipment Div.

The two base tractors, designated D-10 and D-12, include "high clearance" versions for use in high-growing or bedded crops.

The tractors are powered by the A-C Power-Crater engine—an I-head, overhead-valve, four-cylinder unit with wet removable liners. The engine's high torque, according to A-C, allows the tractor to be operated at either the throttled-down speed needed for transplanting and cultivating; or provides open throttle power and speed for plowing and heavy tillage work.

Both tractors are designed for one and two row cultivating and two-plow power. A wide selection of optional attachments and a line of mounted implements matched to the tractor's speed and power are available.

Chrysler Imports Diesels

Chrysler's Marine and Industrial Engine Div. is importing Diesel engines from Germany for sale in the U. S. Chrysler has signed a sales agreement with Klockner-Humboldt-Deutz and the Deutz subsidiary in this country, Diesel Energy Corp. of New York.

Deutz has 16 basic models of air-cooled engines ranging from nine to 300 hp. The high-speed engines feature rapid warm-up (30-60 seconds), individual cylinders and head, high parts interchangeability, and long life.

Diesel Energy Corp. has been importing Deutz Diesels for about five years. Under the new arrangement, the New York firm will cooperate with Chrysler in merchandising and distribution.

Deutz has engine plants in Cologne and Ulm, with other manufacturing facilities in Berlin and Mainz. Production totals about 60,000 units a year, and total employment in Germany is 24,000.

Chrysler is planning to market the Deutz engines for all marine and industrial applications.

Arthur S. Hudson, president of the Chrysler division, says Deutz had been considered for some time for just such an agreement, and the decision was based on the findings of a Chrysler team.

NEWS

CONTINUED

Ford Merges

Ford Motor Co. has merged Aeronutronic Systems, Inc., into Ford, making the West Coast operation a division of Ford instead of a subsidiary. The merger became effective July 1.

Ford owned more than 90 per cent of the Aeronutronic common stock, with key executives of the firm holding the balance. Ford acquired outstanding stock in an exchange of one share for 2.4 shares of Aeronutronic.

The new Ford division ranked 48th in the Department of Defense list of contractors during 1958, concentrating on missile and space work. The division currently holds the Army's prime contract ($23 million) for the Shillelagh surface-to-surface rocket, and is working on more than 30 prime contracts with the Government.

Gerald J. Lynch, formerly president of Aeronutronic Systems, becomes general manager of the division.

Chrysler Gets Tank Order

Chrysler Corp. has received a $20.6 million Army Ordance contract to build 180 M-60 medium tanks at the Lenape Ordnance center in Newark, Del., which Chrysler operates for the government. Production on the 5½-ton tank is scheduled for the April-June period of 1960.

The M-60 is slated to replace the M-48 tank on the battle line. The tank will be powered by a Continental diesel engine and will mount a 105-mm gun. It will carry a four-man crew.

Chrysler had the original vehicle engineering contract for the M-60. In addition to assembly work at Newark, Chrysler will build components in Detroit, Scranton, Pa., and Dayton, O. Airtemp Div. will supply fire control equipment and other components.

Toyota Gets Army Order

The U. S. Army has ordered 5312 2½-ton cargo trucks from the Toyota Motor Co., Ltd., of Japan. The trucks, valued at $18.9 million, will be delivered during the period Oct. 1959 and June 1960.

The purchase is part of a five-year, $33 million program to modernize Army transportation in the Far East, according to Erik J. Hansen, general manager for Toyota in North America. Hansen also added that the Army has reserved an option on 13,719 additional vehicles of the same type.

New Diesel for Case

J. I. Case Co. is planning to build a new line of small Diesel tractors in this country to compete with European imports. The new model, slated to go on sale next December, will sell in the neighborhood of $2750, says Case president Marc B. Rojtman. This would be almost 50 per cent less than Case's present smallest U. S. Diesel.

Although Case had been working on the small Diesel unit for over two years, the possibility of importing still was being considered until recently. Lower unit costs at the company's Rock Island, Ill., engine plant, Rojtman explains, along with other cost savings, will enable Case to build its tractor cheaper in this country.

Ford's Diesel Plans

Ford's Tractor and Implement Div. plans to manufacture four new products, including Ford's first Diesel engine, at the refurbished Highland Park Plant. Other products announced by Merritt D. Hill, division general manager and newly elected company vice-president, are a heavy-duty tractor for industrial use, an offset tractor, and a new tractor transmission.

Ford currently is razing four buildings on the Highland Park location to make way for an additional 153,000 sq. ft. of manufacturing space.

Hill says the new products will allow a "greater penetration" in farm and industrial markets. Ford's tractor production in the first half of 1959 was 21 per cent higher than last year and, says Hill, some 27 per cent of wheeled tractor production in the U. S.

SINGLE DRAWING OPERATION

Special-purpose fenders are fabricated in a single drawing operation without trimming by the Saginaw Metal Parts Corp. As a result of this new production technique, Saginaw says, it now makes about 75 per cent of all fenders used on boat trailers. Top drawing cold rolled sheet steel, vital to the new process, is supplied by Jones & Laughlin Steel Corp.

Bond Steel Sold

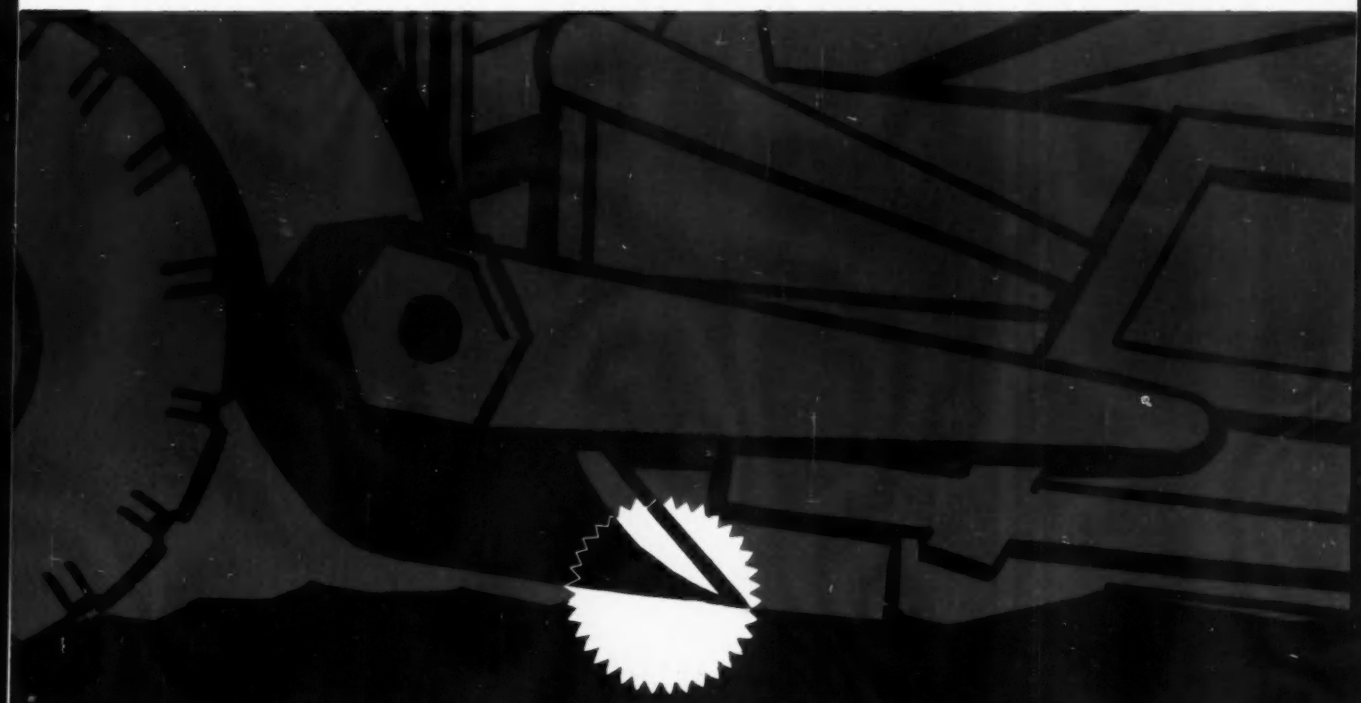
Motor Products Corp. has purchased Bond Steel & Storage Co., Detroit industrial warehousing specialist. Motor Products will operate its new acquisition as a separate division, moving headquarters and operations to the former Mack Ave. plant of the parent firm.

Ford Truck Award

Ford received an Army contract of $1.6 million for development of a series of tactical trucks ranging in size from two to five tons. The contract also calls for development of a new Diesel engine for the medium truck family.

ANOTHER NEW USE
FOR BYERS
AMBALLOY STEEL

AMBALLOY TAKES ON TOUGHEST TERRAINS



Gorging this sod-buster's mouth is a test for scraper blade durability. High-strength Amballoy passes this punishing test with excellent resistance to abrasion, corrosion, shock and fatigue stress.

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Circle 131 on Inquiry Card, for more data

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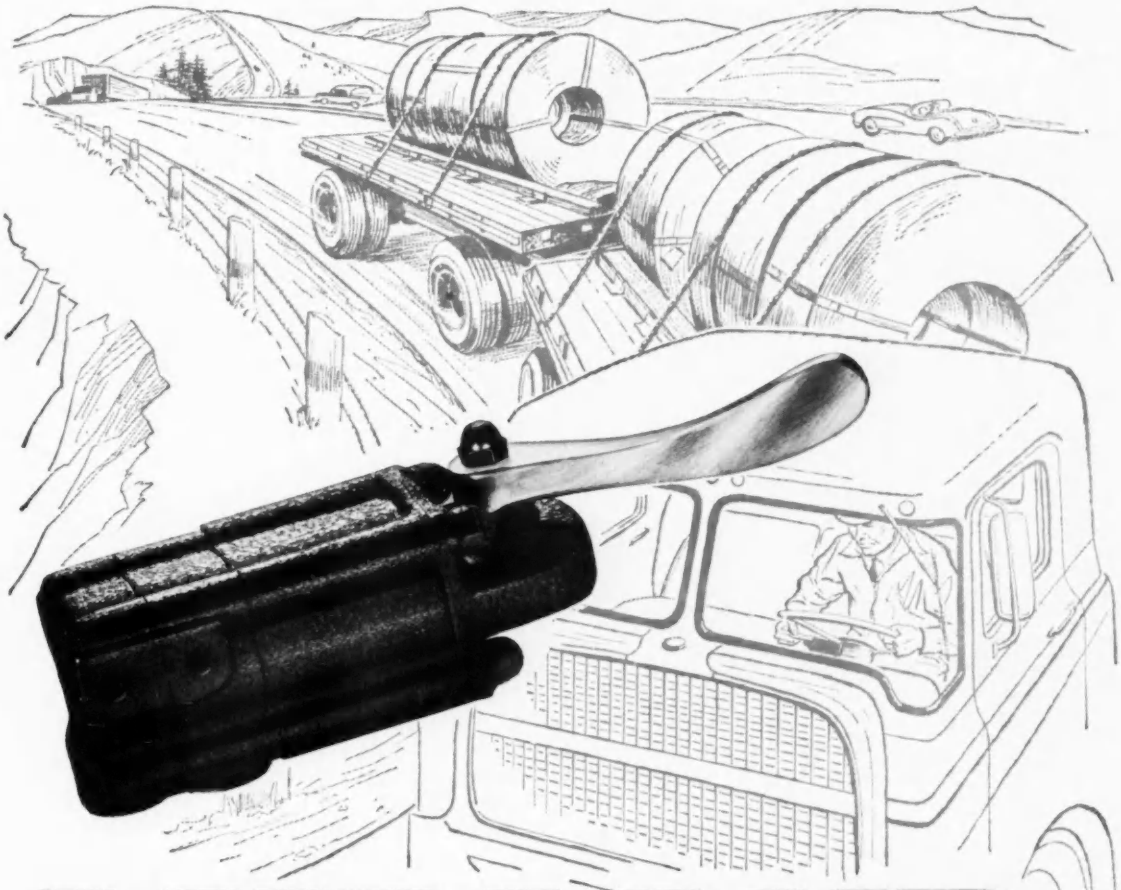

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NEW DESIGN ADAPTS VALVE TO THREE TYPES OF MOUNTINGS

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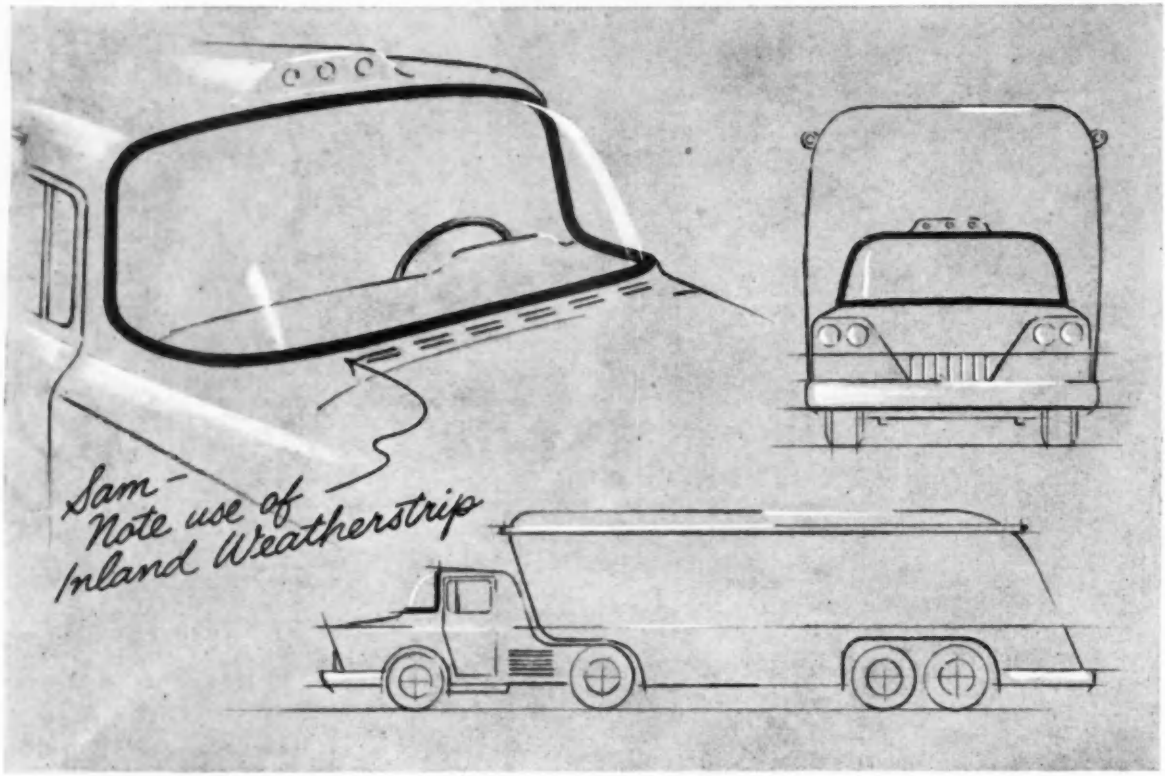
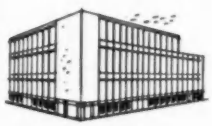


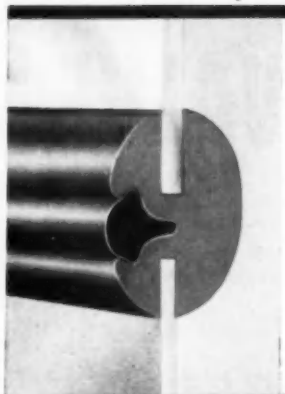

Transportation Industry


Railway Equipment


Over-the-road Equipment


Marine Applications


Commercial Structures



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NEWS

FEATURES

Ford Gets $15 Million Order for MUTT

Ford Motor Co. is going to build the Army's new M-151 ¼ ton truck which is slated to replace the time-honored Jeep in the military motor pool.

Ford will assemble the new lightweight vehicle at its Livonia, Mich., automatic transmission plant. Some 665 subcontractors, most of them in Michigan, will supply production parts, spare parts, tool kits and training aids. Ford's original $15 million Army Ordnance contract calls for 4050 units, with completion of Job 1 in March, 1960.

The truck is the M-151, tagged 'MUTT' (Military Utility Tactical Truck) by Ford.

MUTT Lighter

Ford describes the MUTT as 400 lb lighter than the Jeep. It has a higher power-to-weight ratio, 30 per cent more cruising range on the same fuel load, and 26 per cent more cargo space. Body (by Mitchell-Bentley Corp.) is unitized steel, and engine (by Continental) is four-cylinder, weighing 247 lb.

Willys has not delivered any Jeeps for use by the U. S. military since 1955. But the Jeep still is popular with foreign military forces, and Willys currently is enjoying its best year with the vehicle. Willys recently announced a $2.5 million contract from Army Ordnance for 1600 Jeeps and spare parts designated for the Turkish Army. These units will be shipped knocked down from Toledo for assembly in Tuzla, Turkey.

Other Contracts

Another group of contracts calls for 183 Jeeps and parts for the General Services Administration, including 100 vehicles for Indonesia and 23 for India. Willys also ships its units abroad through NATO, UNICEF and other international organizations.

Willys is doing business with the U. S. military on another combat vehicle, the half-ton M274 Mechanical Mule weapons carrier. In early July, the company received a $2.5 million contract for additional Mules for the Marine Corps.

MUTT

Ford's MUTT features light weight, a rugged unitized body construction, low silhouette, and improved riding comfort.

RENAULT TO OFFER NEW TRUCK IN U. S.

Renault will offer a new lightweight truck in this country early next year. It will feature front-wheel drive and be powered by a four-cylinder, 32-hp front engine. Vehicle will be built on an 89.5-in. wheelbase. Payload is about three-quarters of a ton, maximum loaded weight about 1½ tons. It will come in four body styles: two panel truck versions, a pickup truck, and eight passenger bus.

AI TABLOID

Bristol Siddeley Engines, of England, has developed a "lift-thrust" fan engine which it claims has an extremely high thrust/weight ratio and low fuel consumption. The thrust, provided through ducts for both direct lift and forward flight, is designed to give a supersonic plane STOL and VTOL capabilities.

* * *

A new air control valve provides more complete control of braking action at all times and under any emergency, says Owosso Div. of Midland-Ross Corp. With the new valve, the braking effort is in direct proportion to the pedal pressure. The device weighs only 2 lb, and can be mounted with a foot treadle, a remote mounting, or as a suspended pedal operation.

* * *

Heyden Newport Chemical Corp. is producing a new high temperature synthetic lubricant for use in turbo-jet engines slated for Mach 3 aircraft. In Air Force tests, the new base oil, designated Pentalube TP653, operated at 425 F for 100 hours, and some internal parts were effectively lubricated at close to 500 F, according to Heyden Newport.

* * *

Mobay Chemical Co. is building a new plant at Martinsville, W. Va. to manufacture polycarbonate resins in commercial quantities. Products made from these resins have a very high impact resistance, excellent dimensional stability, and greater resistance to heat, moisture, and weathering than most thermoplastic materials in current use, says Mobay.

* * *

Aluminum Co. of America is installing a 5200-ton capacity extrusion press at its Vernon (Calif.) works as part of a $5 million expansion program. Slated for production early in 1960, the new facility will enable Alcoa to extrude, heat treat, and stretch aluminum shapes up to 34 sq in. in cross-sectional area to meet the demands of the West Coast missile and rocket industries.

General Electric Co. and U. S. Steel Corp. have joined forces to develop better steels for nuclear power reactors. The joint program includes study of a wide variety of steels under actual operating conditions of corrosion and radiation.

* * *

Chrysler Corp's Cycleweld Chemical Products Div. is planning to market a new adhesive and sealer that will retain its strength at temperatures ranging from 0 F to 300 F. Called liquid iron, the new material is a synthetic plastic that, when mixed with clear liquid hardener, sets into an iron-like substance within a few hours. It can be ground, sanded, shaped, filed, or drilled in the same manner as iron, says Cycleweld.

* * *

A three-mile gravel road that "cuts, digs, and gouges" the tread off pneumatic tires has been added to San Angelo (Tex.) tire-testing facilities of Goodyear Tire & Rubber Co. The new road will be used to test wearing ability of new rubber compounds for passenger car and truck tires.

* * *

Du Pont Co. has developed a new electronic device that measures surface ignition in any car engine under actual road conditions. The new device works through special spark plugs installed in each cylinder, which are equipped with tiny built-in piezoelectric pressure transducers. The transducers sense minute pressure changes in the cylinders and translate them into electrical impulses which are recorded graphically on tape.

* * *

Lloyd Motoren Werke, of Germany, is about to introduce a completely new Lloyd 900 car to compete directly with the Volkswagen. The new car, which will sell for about $1250, is said to combine small car economy with the performance and roominess of the medium range class.

TERRA TIRES

Dodge Power Wagon can go anywhere on these giant 46 x 24-20R Goodyear Terra Tires. Except for adding new wheels and trimming the running board and rear fender, no changes were needed on the Power Wagon. Unit is not a standard factory production item.

Russia Trails U.S.

Russia is trailing the U. S. in the development of lubricants, but is trying to catch up by copying the work of Free World scientists, according to a survey published by the Dept. of Commerce.

The survey, based on a study of Soviet technical literature, said Russian scientists were "apparently concentrating on areas fairly well known and defined by U. S. scientists."

This may mean, the survey said, that the Soviets realize the potential importance of the field, but are not especially good at it. They may have to get their knowledge, the survey said, by checking the work of others.

There were no signs in the Soviet literature, the survey pointed out, that any work was being done on synthetic esters as base stocks. Where lubricants were cited, it was indicated that conventional petroleum products from Soviet refineries and crude sources were used. No new techniques for providing high-temperature lubrication were being used.

A great deal of research is being done in phosphorus and hydrocarbon chemistry, the survey found, but there was no evidence that organo-phosphorus compounds were being used as lubricant additives.

L.A., Carmakers Wrangle Over Smog

The debate between the automobile industry and Los Angeles County over air pollution continues. Tempers are getting short.

Gist of the argument: The automakers say they're hard at work on auto exhaust control devices. The County claims the industry is dragging its feet. And it points out that motor vehicle exhaust causes 62 pct of the area's smog.

There were some sharp remarks about the automobile industry at the 52nd Annual Air Pollution Control Assn. meeting held recently in Los Angeles.

Supervisor Warren M. Dorn, chairman of Los Angeles County's Board of Supervisors' Air Pollution Committee, gave the automakers a tongue lashing for failing to report to the conference its accomplishments on exhaust control development. Mr. Dorn's scolding fell on thin air because industry representatives, though invited, did not show up.

Device Shows Promise

It's well known that many companies are working on automotive afterburner control systems. But right now, the only device which seems to show promise is the one developed jointly by Thompson-Ramo-Wooldridge and Chrysler, Los Angeles. So says Smith Griswold, Air Pollution Control Officer, Los Angeles County.

TRW and Chrysler claim that its afterburner will remove 90 per cent of the unburned hydrocarbons. The problem now is how to reduce its cost, size, and complexity.

Ford is working on a catalytic smog-consuming device of its own design. General Motors is teamed up with Houdry in a research program to lick the problem. American Motors says it's exploring two types of smog-reducing mufflers.

Tackle Front End

But maybe the problem ought not to be attacked hind end foremost. Fred L. Hartley, vice-president for research, Union Oil Co. of Calif., thinks the front of the car should have our attention.

Mr. Hartley pointed out to the 500 APCA delegates that evaporation of gasoline puts 20 per cent to 30 per cent of Los Angeles County's hydrocarbons into the air—about 300 tons per day.

Union Oil is now operating six "smogless" cars. They have these features:

- All carburetor vents going directly to the atmosphere are closed. Gasoline vapors from the carburetor go back into the manifold, none into the atmosphere.
- Gasoline in the carburetor bowl automatically drains back into the gas tank when the car stops. This eliminates "hot soak" which sends a good amount of hydrocarbon into the atmosphere.
- The gas tank is insulated and its vent stays closed while the car is in motion.

Air pollution control equipment is now big business. The nation spends $250 million per year to design and build it. Most experts agree that the cost to industry will go up and up.

Chrysler Growth

Chrysler Corp. is preparing itself for anticipated growth of the world market for automobiles and trucks. Within less than a year, the corporation has set into operation a new international organization that already has brought some concrete results.

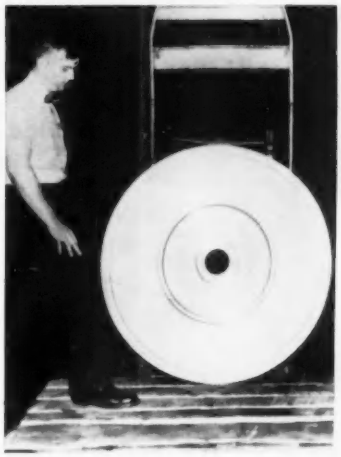
One result is the transplanting of 200 Detroit-area families—children, pets and all—to Geneva, Switzerland, headquarters of Chrysler International, S.A. Another result has been the merging of nearly every Chrysler and Simca dealer in Belgium and a "satisfactory pick-up" in sales in that country.

According to Lynn A. Townsend, group vice-president in charge of international operations, the Chrysler-Simca package is one of the strong points in the new operation. Chrysler now owns 25 per cent of Simca and is believed to be the largest single stockholder in the French automobile company.

Gradually, Chrysler is realigning dealers in countries around the world to take full advantage of the Simca alliance. This gives dealers a line of cars and trucks ranging from the 96-in. wheelbase Simca Aronde to the luxury Chrysler Imperial, and from the Simca van type trucks built on the Aronde chassis to the Dodge and Fargo trucks and the Simca Unic Diesel-powered heavy-duty trucks.

Townsend says he expects the world market to increase rapidly in the next five years. Although he made no official admission, it is expected Chrysler is counting heavily on the small Valiant to gain a stronger foothold in the export market.

GIANT TURBINE WHEEL



This huge turbine wheel was forged in closed dies at Wyman-Gordon's North Grafton, Mass., plant. The wheel is composed of a high-temperature nickel-base alloy used up to now for jet engine blades. With a temperature range of 1500 to 1800 F, the new unit opens the way for higher performance engines in aircraft and missiles.

AVIATION MANUFACTURING

DC-9 Jetliner Will Fly 580 Mph

Douglas Aircraft Co., Inc., disclosed that the DC-9 jet transport announced earlier this month will cruise at speeds up to 580 mph and have a maximum range of 2500 miles.

The DC-9, which is being offered by Douglas for service in 1963, will be powered by four Pratt & Whitney fan-type jet engines that develop a constant thrust of 8250 lb at sea level in air temperatures up to 90F.

Douglas said the new transport would have an operating economy from short to medium ranges "equivalent to that of the 54-passenger, piston-powered DC-6B."

Fuel consumption of the DC-9, according to Douglas, would be about 10 per cent lower than for ordinary jet engines. Douglas attributed the saving to the P&W engine's bypass feature, which allows mixing of some intake air with hot gases exhausted at the tail pipe.

The DC-9 will carry 68 passengers in the first class configuration, up to 92 in the coach version. Maximum take-off weight would be 120,000 lb, wing span 94 ft, length 103 ft, and tail height above ground, 34 ft.

Microwave Device Ups Radar Range

Hughes Aircraft Co. announced it has developed a small microwave device that is "capable of increasing radar range as much as 100 per cent."

The Hughes device, called a "parametric amplifier," is designed to supplement radar equipment used in regulating air traffic. It boosts microwave signals picked up by an antenna, greatly increasing the sensitivity of the receiver.

This gain in sensitivity can result in doubling the distance at which targets can be detected by radar, according to Dr. Nathan I. Hall, the company's vice-president for engineering.

Dr. Hall said the device would make several important contributions to airline safety:

- It would enlarge the area that an airport's surveillance radar could control. This would enable high-speed jets to be detected much earlier than with present equipment.
- Its greater sensitivity would permit detection by airport radars of difficult targets, such as business planes and small military jets. Such planes may fade off existing radar and it is often necessary to delay their landing to permit safe approach of large commercial airliners.
- It would enable jet airline pilots to avoid storms by giving them much earlier warning of weather disturbances.

Company officials said the parametric amplifier, a microscopic solid state device, was developed by Hughes research laboratories after two years of research. Hughes Products Group's Newport Beach (Calif.) plant is now producing several hundred of the new devices weekly to meet current needs.

Boeing Gets Study Award

Boeing's Seattle Div, received an Air Force contract to develop high-temperature materials for air-breathing engines.

The award calls for materials in engine areas exposed to 4000F temperatures and to corrosive action from boron fuel combustion products.

The failure to develop such materials has been a major stumbling block to the use of boron fuels for air-breathing engines, according to Boeing.

Air Force "Brain"

Bendix Aviation Corp.'s Computer Div. has installed a general purpose G-15 digital computer at Kirtland Air Force base AF Special Weapons Center Analysis Div. The computer will be used in solving nuclear energy problems related to weapons, chiefly warhead selection, by simulating their performance.

T53 Engine Order

An Air Force contract for over $24 million has been awarded Lycoming Div. of Avco Corp. for production of T53 gas turbine engines.

The award covers both helicopter and turboprop versions of the engine. Deliveries are slated to begin in September.

Saunders-Roe Hovercraft prototype hovers slightly above ground on trapped cushion of air.

British Reveal Plans for Hovercraft

The Saunders-Roe SR-1 Hovercraft (AI, May 15, 1959) will have its first public showing at Britain's Farnborough Air Show in September.

The new craft is seen as the forerunner of larger surface-skimming amphibians that offer fast, economical transport for passengers and freight at running costs comparable to those of an automobile.

Planned for the future are:

- A 100-ton ferry designed to carry 30 passengers and 30 tons of cargo across the English Channel to France. It would cruise at 90 knots, skimming 1 to 4 ft above the water.
- A 400-ton vehicle transport with a range of 300 miles over water, ice and flat land. Length would be about 220 ft, and it would be capable of carrying 160 tons of payload such as twenty 8-ton trucks—equal to 40 per cent of the laden weight.
- Hovercar for 16 passengers or 1½ tons of freight would cruise at 100 mph over rough trackways free from obstacles, making conventional roads and bridges unnecessary. It would be ideally suited as a communication and supply vehicle for opening up remote areas of Canada, Australia and Africa.

The 7500-lb experimental SR-1 is supported by a downthrusting axial fan that provides an air cushion under the bottom surface. But the principle differs from that of comparable American designs in that a curtain of air blown from the craft to the ground contains the cushion, and lift is determined by the force needed to "bend" the curtain outwards.

Vertical component of the direct thrust forms a negligible part of the total lift. The air cushion is carried along with the craft, losses being replenished from the curtain.

Cushion pressure increases as the height drops, thus providing inherent stability. Forward and reverse propulsion is obtained by bleeding off part of the compressed air into horizontal ducts and nozzles.

Advantages Claimed

One of the advantages claimed for this design is that the thrust needed to lift the craft is much smaller than its own weight, and less than half that of a helicopter.

The Hovercraft carries 40 per cent of its own weight while a normal aircraft payload is only 15 per cent.

In addition, power-weight requirements of the SR-1—130 hp per ton—is below that of a conventional aircraft, which calls for more than 200 hp per ton. Relative lift power decreases with the size of the machine.

The projected 400-ton Hovercraft will need only a quarter of the engine power per ton of a plane, and is expected to carry twice the payload.

1000 Jets Ordered

World airlines have ordered more than a thousand turbine-powered aircraft for delivery through 1963, according to a survey appeaaring in a forthcoming issue of *Esso Air World*.

Another 500 turbines, plus about 50 jet transports, are already in airline service, the survey says.

This year for the first time no new piston planes were ordered, the Esso survey shows. Over 4300 multi-engine piston planes are still flying for commercial airlines throughout the world.

Orders for the new aircraft are almost evenly divided between pure jets and turboprops, the survey reveals, with 556 orders for medium and long-range jets and 469 for turboprops of all ranges.

Boeing leads in the pure jet field with 173 orders from 14 world airlines for the 707. Slated for delivery this year are 69; another 90 in 1960; and 13 in 1961.

Douglas' total for the DC-8 was 143 orders from 18 carriers, with 115 slated for delivery next year.

Orders for short-to-medium haul jets have risen from 154 by 13 airlines in June 1958 to 205 aircraft by 18 airlines today. Aircraft include the twin-jet Caravelle, the Comet IV, Convair 880 and its sister 600, Boeing 720, and De Haviland 121.

The long-range turboprop, regarded as a transition aircraft between the piston plane and the pure jet, continues to be a favorite of many airlines, the survey points out. A total of 228 of all types were on order with 23 airlines. Biggest seller was the Lockheed Electra with 160 orders.

Favorites for short-haul operations were the Fokker and Fairchild F-27 and the Viscount turboprops with 241 orders from 48 airlines.

MEN IN THE NEWS

Timken Roller Bearing Co.—S. C. Partridge was promoted to director of sales, International Divs.

Bullard Co.—Joseph C. Olson was elected vice-president, manufacturing.

Cincinnati Milling Machine Co.—H. W. Carlisle was named manager of the Meta-Dynamics Div., succeeding E. D. Vancil, retired.

Clark Equipment Co., Brown Trailer Div.—R. G. Thorpe was named general sales manager.

Scovill Mfg. Co., A. Schrader's Son Div.—L. R. Doty was made industrial sales promotion manager.

Bendix Aviation Corp., Products Div.—R. H. Long was appointed manager of automotive engineering, succeeding T. H. Thomas who was made assistant general manager of the automotive section.

Electric Storage Battery Co.—**Elmer B. Ott** was elected chairman of the board and **Edward J. Dwyer** president.

AC Spark Plug Div., General Motors—**Frank Curthbertson** was promoted to director of product engineering; **Howard Fish,** manufacturing manager; **Charles Rose,** manager of production control; and **Lawrence Bossman,** works engineer.

Ford Motor Co.—**Victor G. Raviolo** was named executive director, engineering staff, and **Dr. Michael Ference,** executive director, Scientific Laboratory.

Perfect Circle Corp.—**G. Robert Baer** was appointed assistant general manager.

International Nickel Co. of Canada, Ltd.—**J. Stuart Anderson** was elected assistant to the vice-president and assistant treasurer, as well as assistant vice-president and assistant treasurer of International Nickel Co., Inc.

U. S. Rubber Co.—**John V. Drum** was appointed marketing manager of the mechanical goods division.

Jes-Cal Co.—**Glenn Mason** has become sales manager.

Pines Engineering Co.—**George A. Petros** is now sales representative in the Chicago area.

Ajax Electric Co.—**O. M. Haseltine** was named sales manager.

Westinghouse Electric Corp.—**Burr Tupper** was appointed director of works engineering.

Hercules Motors Corp.—**William F. Humphrey** was promoted to director of sales.

Vickers Inc.—**J. M. Dutton** has been named district manager of the midwestern sales office for Aero Hydraulics.

John A. Roebling's Sons Corp.—**William C. Ridge** is now executive vice-president.

Chrysler Corp., New Process Gear Div.—**John P. Davidson** was named production control manager.

Dodge Div., Chrysler Corp.—**E. R. Ross** was made comptroller; **George A. Bilque,** distribution manager; **B. M. Carter,** dealer placement manager; and **F. P. Herman,** business management manager.

Budd Co. Electronic Controls Section—**G. R. Archer** is now chief engineer.

Martin Co.—**J. D. Rauth** was elected a vice-president.

Russell, Burdsall & Ward Bolt and Nut Co.—**J. S. Davey** was elected vice-president, sales.

Thor Power Tool Co.—**R. B. Shulters** is now director of engineering at the Aurora (Ill.) Works.

Surface Combustion Corp., Janitrol Aircraft Div.—**James W. Ashby** was made general manager.

Minneapolis-Moline Co.—**J. A. Miller** was named director of engineering and **M. M. Wachowiak** director of manufacturing.

Carpenter Steel Co.—**J. Moxon** was elected president and **F. R. Palmer** chairman of the board.

Sparton Corp.—**W. R. Murphy** has been elected vice-president and general sales manager.

Ford Motor Co.—**R. E. Skinner** was named manufacturing manager for Indianapolis Steering Gear and Cold Heading Plant.

Eaton Mfg. Co.—**W. E. Gregg, Jr.,** was appointed northeast regional sales manager, and **M. M. Wolock,** manager of the N. Y. district.

Cutler-Hammer Inc.—**P. B. Harwood** has become senior vice-president and **E. B. Fitzgerald,** vice-president, engineering.

Wales-Strippit, Inc.—**R. A. Johnson** was promoted to general manager and **N. F. Weyland** succeeds him as general sales manager.

Dow Chemical Co.—**James D. Hembree** has been appointed a product manager in the Solvents Section of the Chlor-Alkali Sales Dept.

an Editorial

Adding Up the "Plus Signs" at Mid-Year

As THE SECOND HALF OF 1959 gets under way, business continues at a brisk rate in every industry which uses internal combustion engines to provide mechanically transmitted power for equipment. These conditions reflect business trends in the broader span of all-industry. As reflected by the latest survey made by the National Association of Purchasing Agents, at mid-year industrial production throughout the country was holding at a high level and 46 per cent of the N.A.P.A. executives who reported on the survey noted a step-up in production in June, while only 6 per cent observed a decrease. Generally, the first half of 1959 was a better business period than the business forecasters had predicted at the opening of the year.

OTHER GENERAL BUSINESS INDICATORS at mid-year were strong. Electric power output was about 17 per cent above the comparable 1958 level. Freight car loadings were up 13 per cent. Personal savings were up and personal incomes were up, neatly providing a satisfactory background for a record rate of personal spending. Construction activity has advanced steadily in total volume and through June was 15 per cent ahead of last year. Sharing these trends, many other industries have reported "plus signs" for the first half, including a strong advance for the automotive vehicle field. At mid-year, the latter was roughly 40 per cent ahead of 1958. Retail sales of general merchandise have been so good that many stores now report inadequate inventories on some product lines that will continue to sell in good volume through the entire summer. Such indicators add up to provide the appearance of a genuine business boom.

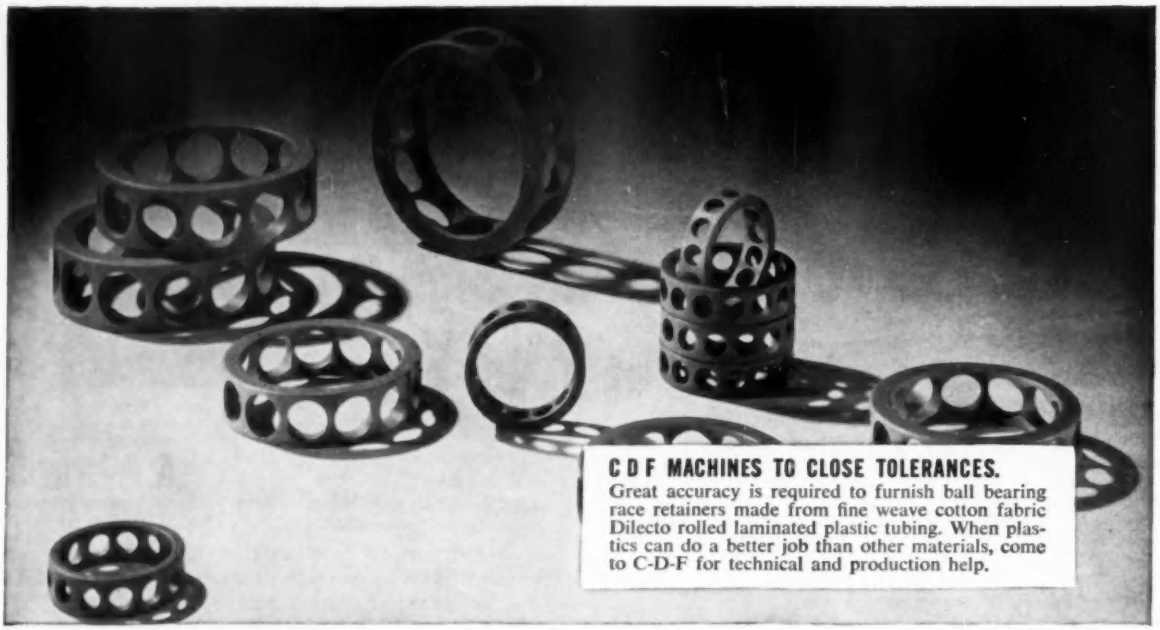
IN THIS SETTING, THE WISDOM of the leadership shown by automotive industry executives appears in a significant way. While theorists rush into print to advocate governmentally sponsored steps to fight inflation, the automotive industry offers an example of a truly noteworthy practical step, the development and introduction of the compact cars.

VIEWED IN THIS LIGHT, the automotive industry might well appear to the impartial and independent economic analyst as the one outstanding branch of American enterprise which has anticipated the economic needs of the American People in the most significant way.

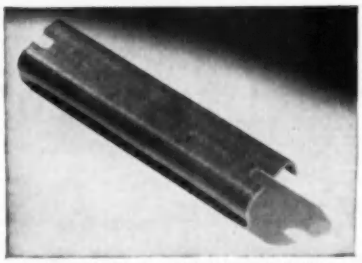
SOON THE COLORFUL STEPS of introduction of the new models of regular-line vehicles will be brightened by the added glamour of the compact cars to provide a record display of variety, sizes, styles and designs of offerings to buyers who now have a greater capacity than ever before, to buy what they want, when they want it. Every employee of the industry, every engineer, every design and style specialist, every production worker, every executive, can approach the last half of 1959 with pride. There are times when an entire industry can take special pride and satisfaction in its performance of creating values and services for the public. The last half of 1959 is such a time for this industry because there is every indication now that the automobile, truck, bus and tractor makers of America, and their specialized suppliers, looked ahead and saw very clearly the challenges of 1959. Then they set about their private industry tasks most industriously to meet the challenge with more and better products, significantly designed to meet the needs of the people. This performance bulwarks the prestige of industry generally, both at home and abroad.

Hartley W Barclay

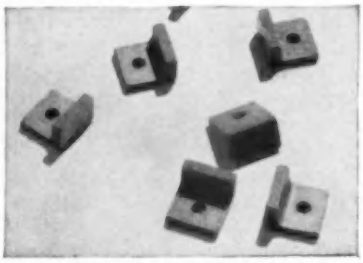
Editor



C D F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



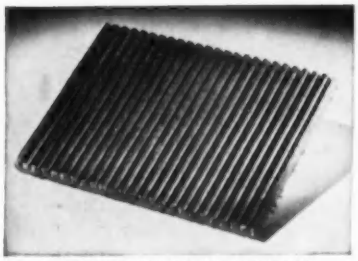
C D F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



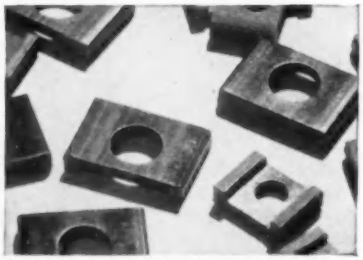
C D F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C D F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C D F is a big reliable source for fabricated plastics!



C D F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C D F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.

C D F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

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AUTOMOTIVE LEADERS

ACTIVE IN ASA PROJECTS

By Vice Admiral George F. Hussey, Jr.

Vice Admiral George F. Hussey, Jr., USN (Ret), Managing Director of the American Standards Association, holds newly published American Standard for Evaluating Load Ratings for Ball and Roller Bearings, B3.11-1959. Automotive industry executives and engineers participated actively in this project.

World-Wide Markets Loom Ahead for American Automobiles

• • • • • • • • • "By participating in international standards work, the American automobile industry assures that its interests are considered. Requirements in other countries that differ from American practices can make costly modifications necessary if American manufacturers want to sell in those markets.

"On the other hand, if vital differences are eliminated through agreements secured by international standards," Vice Admiral George F. Hussey Jr. says, "a truly world-wide market for automobiles can be established, unnecessary costs can be avoided, and everybody will benefit."

THE choice of Detroit as the site for the Tenth National Conference on Standards highlights the importance of national and international standards to the automotive industry. The annual event, sponsored by the American Standards Association, will take place this year at the Sheraton-Cadillac Hotel, October 20-22.

Program chairman is a representative from the automotive industry—Roy T. Trowbridge, Director of Engineering Standards, General Motors Corp., who is one of the most

active men in the voluntary national standards movement. The Automobile Manufacturers Association will sponsor one of the sessions, covering subjects of special interest to the industry, including materials specifications and testing in design, relationship of SAE standards to other industry standards, highway marking and traffic control, and the significance of international standards.

Standards are, of course, the basis of the modern automobile industry. The assembly line would be unthinkable without standard interchangeable parts.

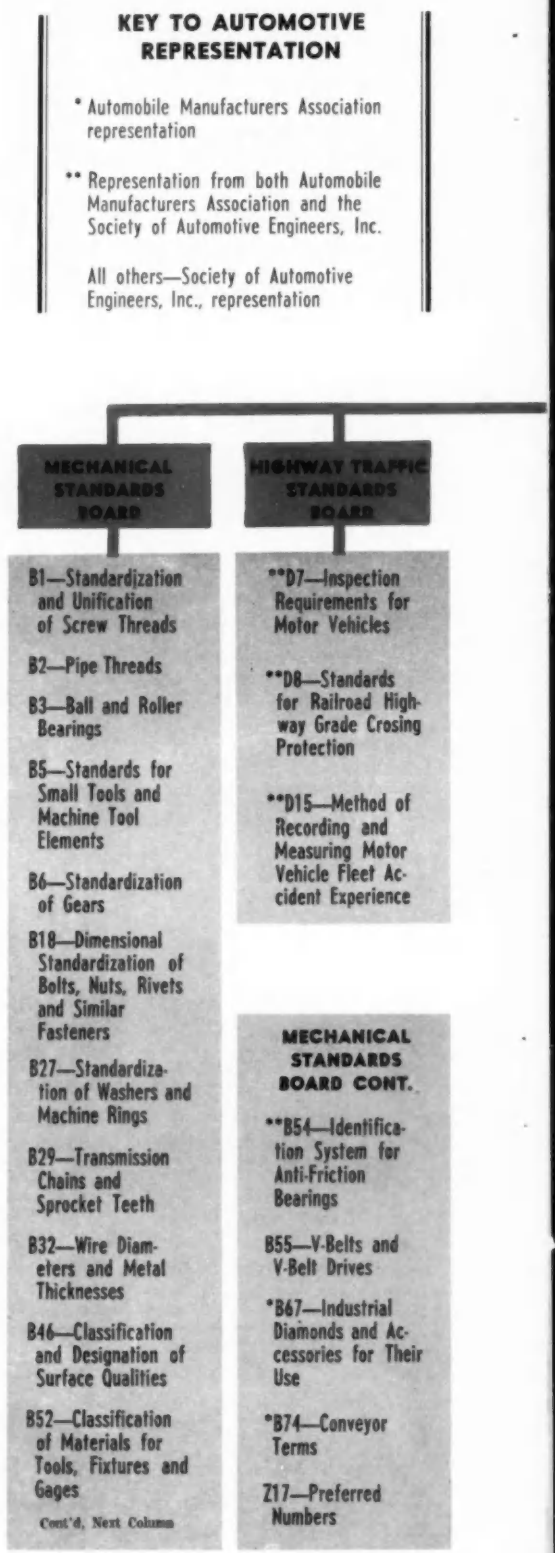
A dramatic demonstration of this fact was given in London in 1908 by Henry M. Leland, who took three one-cylinder Cadillac cars at random from the warehouse of the agency and dismantled them. A control commission of the Royal Automobile Club of England scrambled the parts into three piles of 724 each and then replaced 89 of the parts with new ones from stock. The cars were then reassembled from the piles without hand fitting. The only tools allowed were wrenches and screwdrivers. Then the reassembled cars were driven 500 miles with only one minor adjustment.

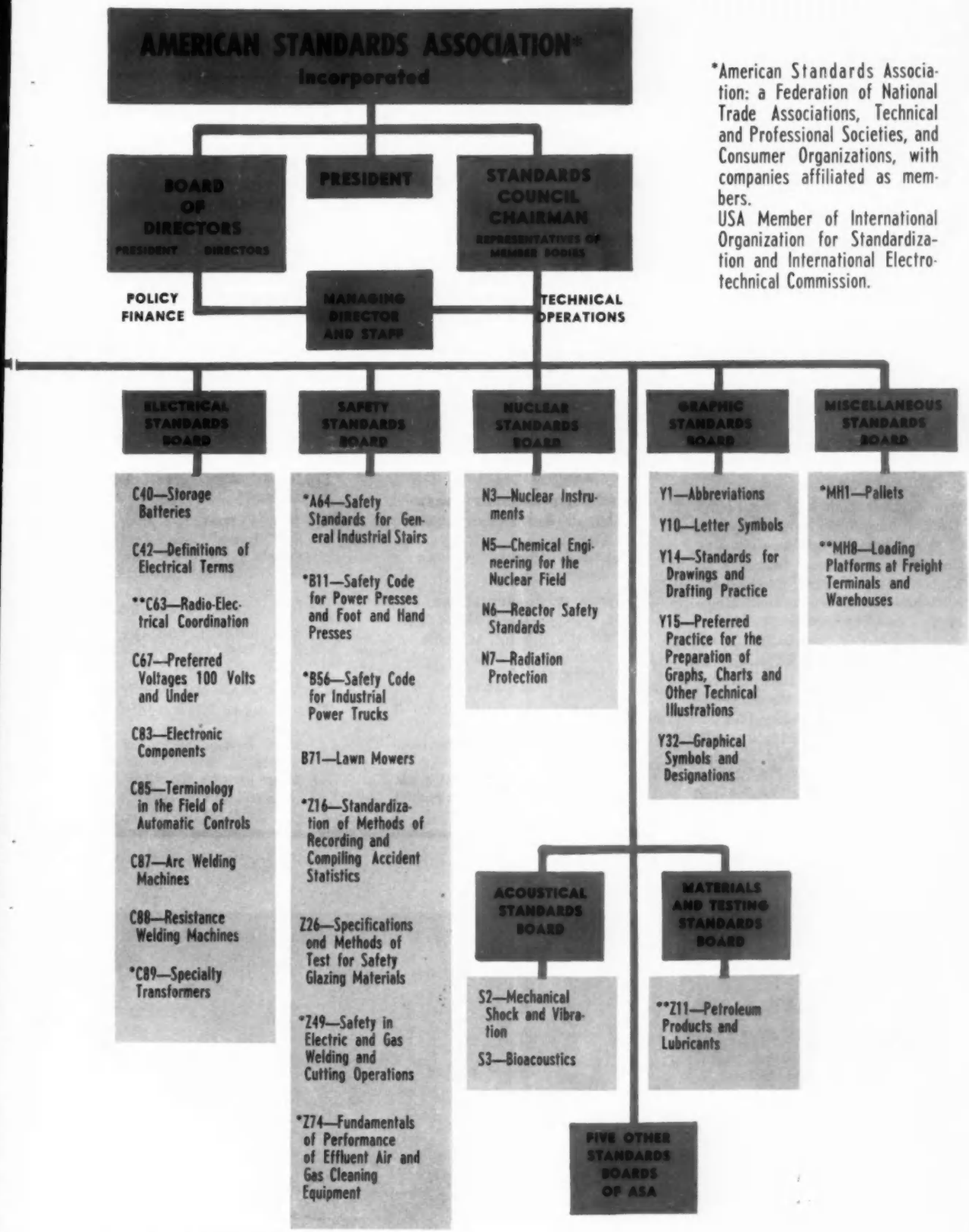
Leland's demonstration proved that modern automobile production and standards are practically synonymous. Individual manufacturers must standardize their parts and production methods to turn out the best possible cars at the lowest possible cost. The entire industry must standardize on such technical features as tires, brake drums, fittings, electrical parts, carburetor mountings, bumper heights, and headlamps. Such industry standardization is carried out efficiently by AMA and SAE.

However, there are standards problems that transcend the boundaries of the industry—problems that involve other industries, drivers and fleet owners, underwriters, safety organizations, the Government, and sometimes even foreign groups. To provide a neutral meeting ground for such varied interests, the American Standards Association was founded.

Today's American Standard red, yellow, and green traffic lights provide an example of the need for the American Standards Association. As late as 1927, a color-blind motorist stood as good a chance as anyone of interpreting traffic signals. Because no national standards existed, he might encounter purple, orange, blue, red, yellow or green traffic lights as he drove from state to state. And if he had been driving one of the modern low cars, he might have had to stop a block away from the light in order to see it. Early signals were often as high as the second story on a building.

These problems have been solved by several national codes, approved as American Standards. The codes were developed with the participation of all national groups concerned with the subject, including the American Association of State Highway Officials, the National Safety Council, the National





*American Standards Association: a Federation of National Trade Associations, Technical and Professional Societies, and Consumer Organizations, with companies affiliated as members.
USA Member of International Organization for Standardization and International Electrotechnical Commission.

Bureau of Standards, the Institute of Traffic Engineers, the automobile industry, and many others.

ASA's role in the development of these standards was twofold: organizational and judicial. In its organizational role, it provided a neutral meeting ground and standardized procedures for the development of standards. In its judicial role, it certified that a consensus of all groups substantially concerned with the scope and provisions of each standard had been reached. This impartial approval is particularly important for standards that are to be adopted by local, state, or Federal Government authorities.

Five Major Societies

The need for a national standards organization was first recognized during World War I by five of the leading engineering societies—The American Institute of Electrical Engineers, The American Society of Mechanical Engineers, and American Society of Civil Engineers, the American Society of Mining and Metallurgical Engineers, and the American Society for Testing Materials.

Each of these societies had for many years conducted standards work in its own field. During World War I, however, it became apparent that national standards cutting across many industry and engineering lines were required

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C88 H. A. Geisendorfer, Chrysler Corp.
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Z49 *Ralph Batten, Chrysler Corp.

Z74 K. E. Robinson, General Motors Corp.

*Representative of Automobile Manufacturers Association. All others—representative of Society of Automotive Engineers, Inc.

for the war effort. The five societies founded a national coordinating body, the forerunner of ASA.

Over the years, ASA has been reorganized to meet changing conditions, and has grown to include 64 member bodies, 57 associate members, and about 2000 company members.

◀ ***A typical subcommittee meeting. Members at this meeting are: J. F. Smith, Union Chain & Manufacturing Co., Sandusky; P. J. Imse, Chain-Belt Co., Milwaukee; B. L. Pearce, Link-Belt Co., Indianapolis, Chairman; W. E. Land, U. S. Army Engineer Research & Development Laboratories; G. W. Haaff, Link-Belt Co.; A. W. Lemmon, Jeffrey Manufacturing Co., Columbus; and E. L. Harris, Chain-Belt Co.***

Member bodies are professional and technical societies and trade associations that control ASA affairs through their voting rights. Among the 64 member bodies are the Automobile Manufacturers Association and the Society of Automotive Engineers.

Associate members are organizations that pay lower dues than member bodies and have no voting rights. Any national organization can apply for membership in either category. Membership in ASA, as well as the use of American Standards, is entirely voluntary.

Board Representatives

The automotive industry is represented on ASA's board of directors by H. E. Chesebrough, vice president and general manager, Plymouth Division, Chrysler Corporation.

ASA derives its entire income

(*Turn to page* 120, *please*)

Latest Automotive Developments Discussed at

Summer Meeting *of the* SAE

By Charles A. Weinert
EASTERN EDITOR

MAJOR automotive developments—in materials, testing methods, and design of components—were fully explored at the Summer Meeting of the Society of Automotive Engineers. Participation of overseas engineers—British, French and Belgian—contributed a great deal to the well-rounded program. Overall, it was a comprehensive meeting, with many facets covering a wide field of current subject interest.

Held in Atlantic City, N. J., on June 15-19, the national conference had an attendance of more than 1200 automotive executives and engineers. Altogether, there were 20 technical sessions at which 45 papers were presented, plus four panel discussions.

Among the engine topics discussed by specialists were: evaluations of fuels and lubricants; development of a new Diesel engine; cooling system problems; studies of engine noise from abnormal combustion; and radioactive tracer techniques as applied to the measurement of engine wear.

Detailed descriptions of the plastics and elastomers applicable to automotive vehicles occupied important places on the program. Military vehicle mobility, small cars, truck transmissions, electrical equipment, engine governors, metallurgy for the engineer, and spare tire elimination were other major subjects.

The European Common Market, automation in the Renault factory, and even high-energy particle accelerators also came in for discussion. Another outstanding contribution was the presentation of a report by 16 engineers on the safety features incorporated in the basic structures of American automobiles.

Finally, at the four panel sessions, methods for developing passenger car seating, glazing materials, selection of departmental managers, and use of latest adhesive materials were reviewed by the panel members. It will thus be seen that the agenda was large in both variety and scope.

. . . Horning Memorial Award

THE 1958 Horning Memorial Award was presented to Darl F. Caris and Edwin E. Nelson of General Motors Corp. engineering staff at the opening of the session on engine combustion noises. They received the honor for their technical paper, "A New Look at High Compression Engines," which was given at the 1958 Summer Meeting. The award is made annually to the author or authors of a paper presented before Society meetings which is judged to contribute the most toward expanded knowledge of combustion phenomena in engines.

. . . Engine Noise from Abnormal Combustion

SOURCES of rumble and thud—the latest of disturbing noises coming from some modern high-compression engines—have been pinpointed, according to the findings of E. S. Starkman, University of California, and W. E. Sytz, California Research Corp.

They reported that simultaneous recordings of cylinder pressures, audible sound, and crankshaft motion have disclosed that rumble is a noise associated with bending vibrations of the crankshaft. And that these vibrations are caused by abnormally-high rates of pressure rise near TDC piston position.

Thud, on the other hand, is said to be a torsional vibration of the crankshaft, similar in sound to rumble, but caused by much earlier occurrence of the maximum rates of pressure rise.

During tests, rumble was induced by aspirating combustion chamber deposits into the intake manifold of the engine. Thud was induced by manually overadvancing the distributor timing.

Under wide-open throttle conditions a power loss of 19 per cent, a reduction of exhaust gas heat of 10 per cent, and an increase in cooling system load of 50 per cent were observed to accompany rumble. However, after three hours of deliberately-induced rumble, the engine upon tear-down showed no detectible mechanical damage.

Surface ignition is influenced by both engine configuration and fuels, the meeting was informed by S. Hopkins, R. J. Pecora and N. Alpert of Texaco, Inc. Based on their investigation, hemispherical and inverted-V combustion chambers appear to be more effective than wedge type combustion chambers in

controlling surface ignition and surface-ignition-induced noise. Phosphorus fuel additives help in reducing the level of surface ignition, but are not a complete cure, they said.

R. C. Tupa of The Standard Oil Co. (Ohio) reported a direct relationship between early surface ignition and detectible engine roughness. He said that immediate improvements in roughness (58 per cent) and harshness (28 per cent) were obtained by control of early surface ignition with boron fuel additives. Further, that benefits also accrue through long-term deposit modification by the use of additives. This speaker also reported that misfiring roughness, from gross migration of light-duty deposits shorting spark plug electrodes, appears to be triggered by both audible and inaudible surface ignition.

. . . Lubricants for Two-Stroke Engines

It was generally agreed among the speakers that lubricants containing additives materially outdo the performance of non-additive oils in small two-stroke engines. Applications under consideration were outboard motors and engines in generator sets, lawn mowers, chain saws, scooters, motorcycles, and small automobiles, among others.

There is also agreement on the fact that such additive oils must be very carefully compounded and designed specially for two-stroke engine use. Opinions as to the most desirable additive types do, however, vary with the findings of the independent researchers. These findings were disclosed at a session devoted to the subject, in which three papers were presented, and by a paper in another session outlining experiences abroad.

J. W. Savin, Atlantic Refining Co., reported that field tests with the most-promising of three experimental additive blends had shown marked improvements in reducing wear, spark plug fouling, combustion chamber deposits, piston varnish, ring sticking, port blockage, and corrosion.

H. V. Lowther, G. H. Shea, and K. C. Kresge of Socony Mobil Oil Co., Inc. reported favorable results with metallic detergents, and no advantage with non-metallic detergents, from the standpoint of piston cleanliness. Also that the base oil volatility, in the absence of proper anti-wear agents, has a major effect on wear; and that no VI-improvers or anti-wear agents, evaluated prevented wear as well as the use of bright stock or heavy distillates. An all-inclusive solution was not presented by the authors, who stated, "Although it is one thing to determine how to improve each performance feature, it is yet another (and much more difficult task) to combine each optimum factor into one lubricant."

L. O. Bowman and R. W. Burchell of California Research Corp., based on their studies, said that an oil containing an ash-free detergent—designated Ashless Detergent Q—satisfies the diverse requirements of two-stroke engines. Field and laboratory tests showed greatly reduced deposition resulting in reduction of piston ring sticking, spark plug fouling, performance loss from port plugging, and piston scoring.

Alfred Towle, Lubrizol International Laboratories (England), summarized his findings by saying that medium-VI SAE 30 oils containing 10 to 20 per cent of bright stock, compounded with alkaline-type detergents at or about 2104-B level and with special additives to afford protection against spark plug "whiskering" and bearing corrosion, appear to offer satisfactory all-around characteristics.

. . . Military Vehicles

For the Army the operational factor needed most is vastly-improved mobility for the ground soldier. That was the theme of a presentation by Major General H. W. Johnson, USA, Deputy Chief of Staff for Combat Developments, U. S. Continental Army Command.

In his address he pointed out that nuclear weapons will enforce the concept of wide dispersal of equipment to minimize the effects of enemy atomic strikes, and that faster mobility is required to rapidly mass these dispersed formations for attack and later redispersement.

With respect to vehicle characteristics, he called for a payload-to-gross-weight-ratio of at least 50 to 70 per cent, ability to operate over field terrain of all kinds, simplicity of operation, ruggedness and dependability, and minimum maintenance requirements.

Reduced frequency of fueling is a particularly major factor, he explained, saying that more than half of the tonnage moved overseas in World War II consisted of fuels and lubricants. General Johnson expressed the hope that someone in the near future will devise "an efficient method of manufacturing some sort of chemical or other type of fuel for use in a portable nuclear reactor from materials readily available in all parts of the world." This, he declared, would result in real advantages.

General Johnson also called for reduction of lead time. He said it now takes the Army an average of 8 to 10 years to go from concept to items in the hands of the troops—and that "this is too much time."

The field soldier and industry must work closely together on military equipment, particularly in the early stage of development, he opinioned, saying such cooperation "will eliminate many costly and time-consuming errors."

. . . Off-the-Road Testing

Tape programming of dynamometer facilities for determining engine octane requirements or for testing oil economy with various piston ring combinations is apparently a satisfactory answer to duplicating actual road-test operation with off-the-road testing facilities. That conclusion was reached after hearing two of the papers presented during one of the sessions sponsored by SAE's Fuels and Lubricants Activity.

Actually, the tape programming is only a relatively

small part of the equipment in one of the installations, which consists of a vast eight-unit outdoor road-load dynamometer setup. This installation was described by O. G. Lewis, R. R. Risher, Jr., and J. A. Wilson of Esso Research & Engineering Co. Test data was first accumulated on the road with a specially-instrumented test car driven under a wide variety of operating conditions. The chassis dynamometer design was based on actual road loading and temperature data obtained with the equipment in this car. Throttle positioning and brake application signals for control of cars on the dynamometer were recorded on multi-channel magnetic tape. Operation of the dynamometers is therefore automatically controlled by this tape for high-mileage accumulations. For example, at an average speed of 25 mph, eight cars can be driven a total of 4800 miles in 24 hours on the eight-dynamometer stand.

The other installation was described by V. C. Vanderbilt, Jr. and C. L. Zimmer of Perfect Circle Corp. In this application, the road test data is recorded on magnetic tape using a separate frequency-modulated a-c signal band for each of the parameters. These consist of engine speed, coolant temperature, manifold pressure, and oil temperature. These data are then played back through electronic equipment in the laboratory to control the reactions of the engine on the dynamometer and thus simulate operating conditions on the road.

. . . Extracts . . .

As a supplement to the foregoing, selected portions of several of the many outstanding papers given at the Summer Meeting have been extracted and are presented in the following:

The Expanding Polymer Horizon

By J. H. Du Bois
J. H. DU BOIS CO.

It is expected that the improved machinery now being built (Fig. 1) will permit the blown plastics to compete with glass and metal containers in the near future. Improved materials and blowing machinery have indicated several expected automotive uses for blow molded plastics. Typical items in this field include the following:

Windshield visors and arm rests can be blow molded of polyethylene or polypropylene that will have good safety features, desirable tactile surfaces, light weight and reasonable cost.

Increased use of plastic bottles for windshield wash liquids will come with cost reductions and more functional designs. For example high density polyethylene gallon bottles now cost 25½¢ compared with glass at 28-30¢. Accordion shaped bottles can be caused to discharge a simple mechanical linkage.

Many studies are being made to make advantageous use of plastics in the brake and shock absorber systems. A high density polyethylene or a nylon blow molded vacuum cylinder are very real possibilities.

Several improved materials and treating processes have indicated the future potential of blow molded containers for motor fuels. While considerable work lies ahead in solving the permeability problems, the potential is very real. Costs will be attractive and shapes may be achieved that will make maximum use of irregular space areas.

Bellows type "bottles" will prove to be economical for foot pedal windshield activators and for the accelerator and brake seal.

Potential use of blow molded plastics in the automotive field is aided by low mold costs, fast tooling and production technique flexibility which permits design variation, color and low product cost.

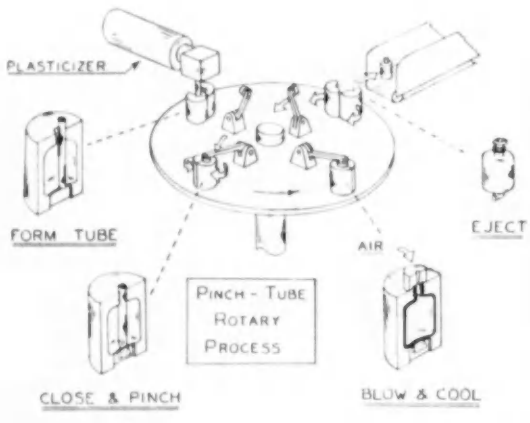


Fig. 1 — Pinch tube rotary process developed by Plax Corp. for blow molding hollow objects. The plasticizer extrudes a tube of plastic material. As the die closes, the bottom end of the tube is pinched and air is injected at the top to "blow" the shape. Cooling takes place as the mold moves around the table. The product is ejected from the mold by an air blast in the last stage.

Trends in Truck and Bus Electrical Equipment

By W. C. Edmundson
Delco-Remy Div.
GENERAL MOTORS CORP.

A NEW and rather extraordinary a-c generator has been developed for even higher requirement applications. This was offered for use on city coaches. First, let's look at how city coach loads have grown through the years (Fig. 1). Special lighting, heating, and air-conditioning requirements create heavy demand. On city coaches most of this capacity is needed at idle, because in many metropolitan areas the average speed is only five miles per hour and the driving is of the "goose and coast" variety.

Using new components and materials only recently available, a radical

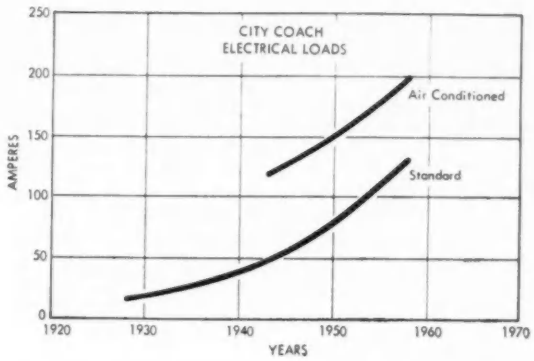


Fig. 1 — Trends of electrical loads in city coaches

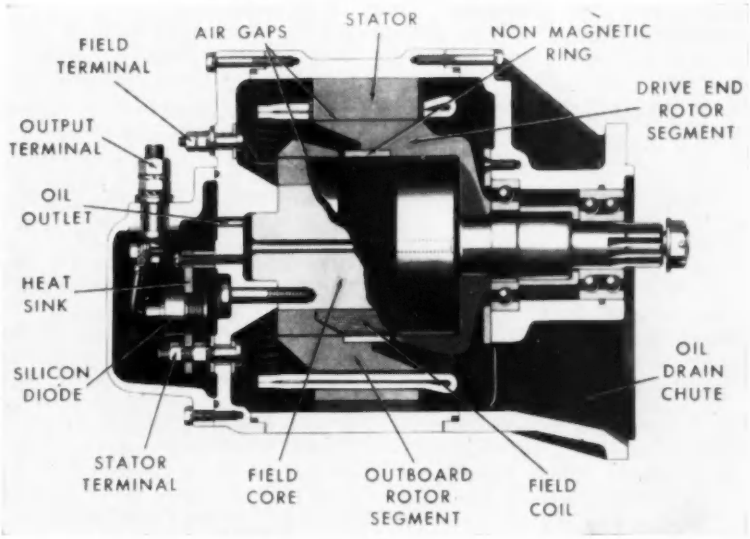
generator was conceived. It was to be cooled with engine oil circulated inside the case. For that reason, conventional carbon brushes on commutators or slip rings could not be used. Accordingly a brushless a-c generator design was adopted. Cooling the high output rectifiers was also a problem, but this was done by the same oil as used to cool the windings, by mounting *silicon* rectifiers under a cover opposite the drive end. (Fig. 2.)

There were problems to overcome, of course, especially to find the insulating materials and varnishes which would stand up in hot oil. These have been found, with indicated quality good enough to say that the whole generator ought to last as long as the one-hoss shay. With no slip rings and brushes, with high grade materials, with no wearing parts except the ball bearings, and those supplied with copious quantities of clean oil—this unit should be indifferent to environment or load.

Speaking of load, this 130-lb generator has a top output of 215 amp and gives 135 amp at idle. The prior split-field generator was only slightly smaller in diameter and weighed approximately the same. Output per pound is nearly doubled.

A study of the cross-section may help to explain "brushless" construction. Starting at the drive end, you can see how the oil drains back to the engine on this flange-mounted design. On a belt-driven job, a sump and drain hose would be used. The stator is conventional, except for special materials to stand hot oil. It is fitted into an aluminum case, with oil passages at the outer surface of the iron stack. The end bell which would normally enclose the slip rings and brushes here supports the poles and field coil. The magnetic path is from one pole to the rotor fingers through the stator to the outboard fingers (supported by a non-ferrous ring from the rotor on the shaft) to the other pole and back through the core. This double Lundell rotor with double air gap supplies the rotating field to generate voltage and current in the stator. The overhung construction and double air gap do require accuracy in construction.

Fig. 2—Oil-cooled a-c generator



Radiotracers in Piston Ring Wear— An Original French Method

By J. Thiéry
INSTITUT FRANCAIS DU PETROLE

THE radiotracer test method, applied in laboratories as well as on the road, has already provided extremely interesting data upon the complex mechanisms involved in internal combustion wear studies.

Nevertheless, it must be pointed out that this radioactive technique still suffers from certain disadvantages, and it does not permit the best application to be made of the possibilities offered by the use of radiotracers.

First, there is a practical limitation in sensitivity, although it would appear apparent that this can be made as high as desired merely by increasing the specific activity of the piston ring or the volume of oil circulating around the detector. In practice, when measuring the cumulated wear of the sump oil activity against time, one is limited by the space available on the recording paper. Therefore, if tests are run for several hours at a substantial engine wear rate, it is often necessary, owing to the limited enlargement of the recording paper, to reduce the range of sensitivity upon the rate meter. Thus, full advantage cannot be taken of the maximum obtainable sensitivity with the apparatus.

Another disadvantage with the method is that it does not permit an accurate detailed analysis of the beginning of the wear curve in order to establish startup wear, which is, of course, particularly important in many cases.

Furthermore, the method takes account only of wear debris dispersed in the oil and does not consider those particles eventually escaping with the combustion gases or embedded with lacquer and varnish in piston ring grooves. The amount in these cases may vary with the type of oil being used and particularly with its detergency characteristics.

Therefore, our IFP-RA3 method was developed in an attempt to overcome the disadvantages outlined above. At the moment, it is used for piston ring wear studies but, without

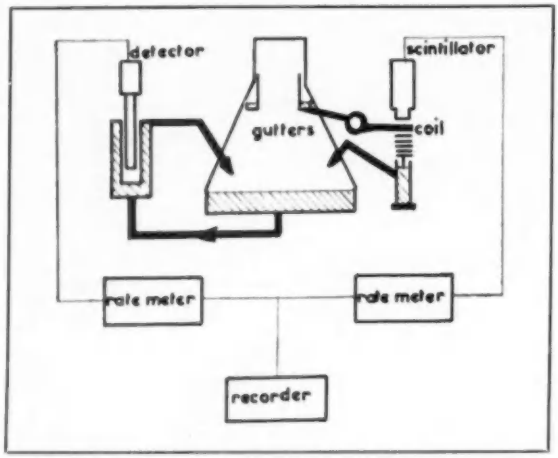


Fig. 1—Schematic of I.F.P. RA3 radiotracer method

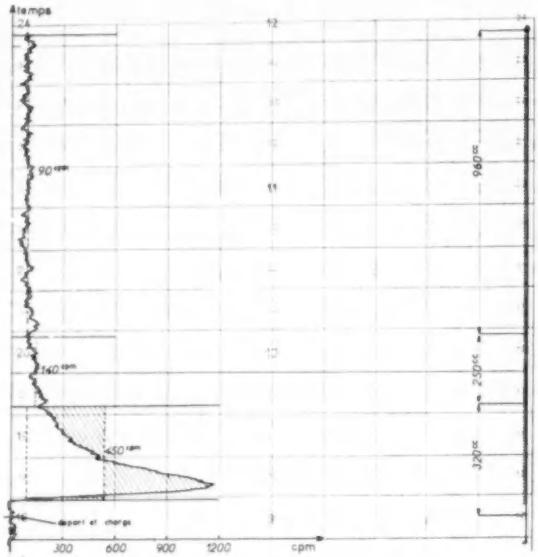


Fig. 2—Recorded curve with the I.F.P. RA3 method

major modification, it can be used for other moving and wearing parts of engines, so long as oil is available to circulate the wear debris.

Measurements are made of the radioactivity of the oil-containing wear debris which flows down along the cylinder wall. This "moving down" oil is collected in gutters at the bottom of the liner. It is then pumped from these gutters to a coil around a scintillator, and then returned to the sump. Proper design of this oil circuit enables recording of both the activity and oil volume flowing around the scintillator during the test. It is also possible to simplify the scheme so that, when flowing out from the scintillator coil, the active oil is received in a graduated vessel and then periodically returned to the sump.

In fact, the gutters cannot be continuous all around the bottom of the liner, since sufficient clearance must be provided for the connecting rod, and thus, a constant amount of the "moving down" oil (about 40 per cent) flows directly back to the sump.

For this reason, and also because of the pumping to the sump of the oil moving around the scintillator, the sump oil gradually becomes radioactive. Thus, an unknown fraction of already recorded wear debris continually flows through the ring belt area, before returning once more to the scintillator. It would thus be impossible to interpret the recorded curve, and it is necessary to overcome this difficulty by measuring also continuously the activity of the sump oil, which is in fact the source of the oil film upon the liner.

We thus achieve two counts, one for the "moving up" oil, and the other for the "moving down" oil. The activity of the "moving up" oil is continuously subtracted from that of the "moving down" oil by putting in opposition the outlet voltages of two identical rate meters (Fig. 1). This difference in radioactivity represents at any moment the activity gained by the oil when flushing through the ring belt area, and this gain is proportional to the instantaneous wear of the ring which occurred a few minutes earlier. A constant wear rate may thus be represented by a vertically recorded curve (Fig. 2).

Before starting a test, the background value is recorded. This value is reduced to zero, by adjusting the position and geometry of the two counting apparatus. Thus without oil, or with the same radioactive oil, they both deliver identical counting rates to the rate meter.

A few minutes after starting and loading the engine, a steep increase in differential activity occurs due to the arrival in the scintillator coil of the oil containing startup wear debris. When this oil emerges from the coil, and also when the wear rate (high when starting) becomes lower, the differential activity decreases and stabilizes in a vertical curve.

The Development of Two New Allis-Chalmers Diesel Engines

By Hans L. Wittek
ALLIS-CHALMERS MFG. CO.

THE crankshaft received our particular attention. Figure 1 shows the results of bending fatigue tests carried out with the old "844" crankshaft as well as with two new crankshafts. These tests were performed in a resonant fatigue testing machine which is calibrated statically for each type of test specimen. The specimen is regarded as broken as soon as a change occurs in magnitude and shape of the signal produced by two of the strain gages, that is, at the very onset of a fatigue crack.

Old style crankshafts had to be used in the first batch of experimental engines. Some of these crankshafts, although they did not fail, showed that they were operating near the fatigue limit. Thus, the 28 per cent higher fatigue strength of the new shaft provides a comfortable margin of safety.

The condition was further improved by a substantial reduction in torsional amplitudes, resulting from the use of a de-tuner in place of the former damper. Figure 2, obtained from a C.E.C. torsiograph and meter at full No. 1 curve output of the turbocharged engine, shows the comparison. (*Turn to page* 94, *please*)

By Dr. P. W. Lett

Chief Engineer
Defense Engineering

CHRYSLER CORP.

PART II

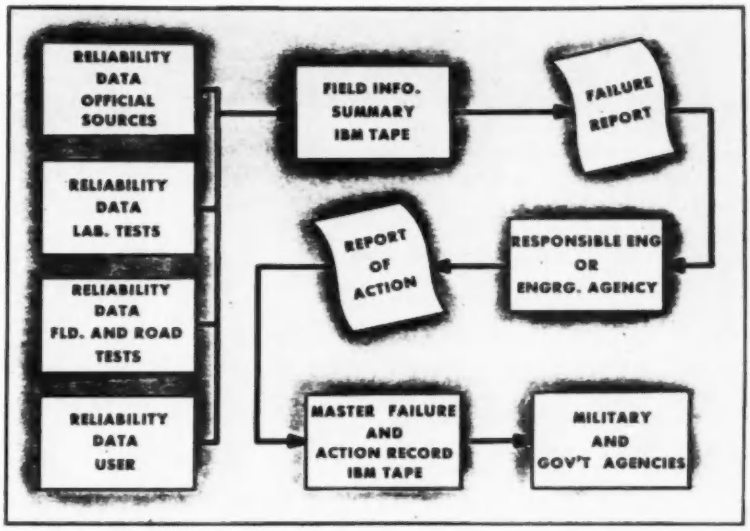


Fig. 1—Reliability data flow chart

DEFENSE ENGINEERING Plans Military Vehicle Reliability

Processing and Interpreting Reliability Data

HAVING discussed the organizational structure of Field Operations in Part I of this two-part article, we shall now consider the systems by which reliability data is processed and the manner of its interpretation. All reliability data, whether it originates externally with the user and official sources, or internally within laboratories and field and road Test, is transmitted to the Diagnosis Section of Field Operations. Here, every deficiency that completes our "product improvement cycle" makes use of these instruments: (1) Field Reporting, (2) Field Information Summary, (3) Failure Report and Reply with reliability data, and (4) Report of Action. The flow of reliability data is shown in Fig. 1.

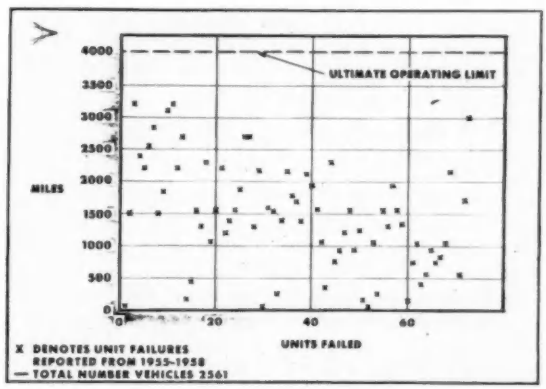


Fig. 2—Failure survey scattergram, speedometer assembly 396

Field Reporting

Data from the field are reported on two basic form-type reports. These reports are the VMR (Vehicle Maintenance Report) and the Weekly Progress Report. The VMR is an IBM card which is prepunched to include a report and station number for control purposes, and is used to report all failures and deficiencies encountered. The VMR has been designed to include all pertinent data such as part number, part name, serial number, and so forth. The engineering representative has but to fill in this information, select the appropriate failure code appearing on the reverse side of the card, and add any pertinent remarks that may be required. The Weekly Progress Report includes a summation of unit activities, general information, supplementary VMR information (which is appropriately cross-referenced), suggested modifications, and field modifications.

Field Information Summary

Data received from the field are disseminated immediately by two publications, depending on require-

ments. These publications are the Weekly Dispatch and the Engineering Representative's Report. The field data then is integrated with the normal flow of product improvement data to form the Field Information Summary. This Summary is an IBM tape which includes all failures and deficiencies reported on a particular vehicle by part number within a group.

Failure Report and Reply

The Summary is continuously screened to determine any failure trends that may develop. All such trends along with critical and official deficiencies are immediately reported to Engineering on a Failure Report and Reply form, with supporting information as required. The supporting information may include histograms, scattergrams, failure distribution curves, and other reliability data. Let's look at an example. We see by this scattergram (Fig. 2) that 72 failures have been reported on this item out of 2561 units in the field. The scattergram gives us a quick picture as to the failure distribution; it provides an undisputed basis for discussions on safety factors and safety margins. The failure rate curve (Fig. 3), the failure histogram (Fig. 4), and the reliability curve (Fig. 5) provide a basis for further study and analysis in conjunction with part performance in the vehicle. It is the information provided by the reliability curve that is the basis for over-all vehicular reliability study.

To cite a hypothetical example, consider tank tracks made up of link assemblies and end connectors. There are 156 end connectors on the tracks, 10 of which fail before the vehicle traverses the prescribed 5000 miles under given conditions. Eighty-four percent of the connectors performed satisfactorily. The reliability factor of the end connector is 84 percent. Accordingly, if a given track link assembly also had a reliability factor of 84 percent, the reliability of the track itself would be 0.84 x 0.84 or 70 percent. Now, repeat this process for the 35,000-odd parts making up a complex tank; the cumulative effect of each individual part on over-all vehicle reliability is striking. Obviously, attainment of a respectable reliability figure for a vehicle is a difficult task requiring a high level of continuing product improvement effort.

The reliability of our "in-service" products is determined by the method described above. By application of these data we can predict to a degree the performance of new vehicles. Chrysler Defense Engineering began such probability studies in 1954 because we believed that the performance of a product could not be predicted solely from laboratory test data. Obviously, every factor having an effect on the life of a product cannot be simulated; this is particularly true with a vehicle operated under combat conditions and used for troop training. Vehicular reliability data accumulated over the past years has proven this. These "actual" failure data show that the failure rates follow erratic paths—there is no one equation that will fit all these curves.

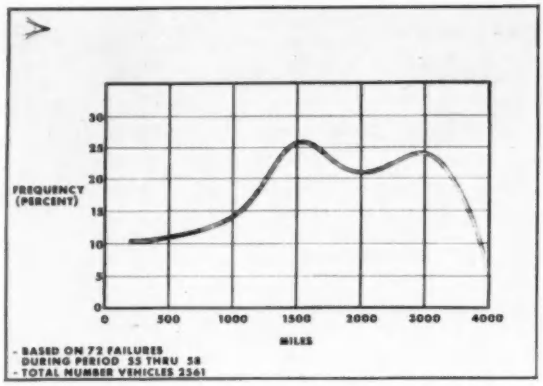


Fig. 3—Failure rate curve, speedometer assembly 396

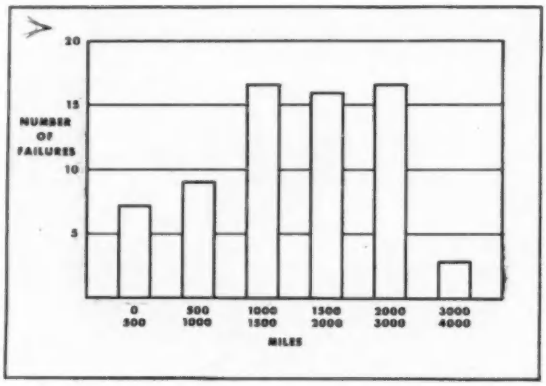


Fig. 4—Failure histogram, speedometer assembly 396

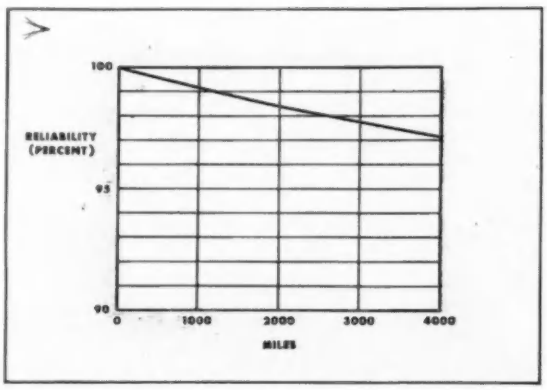


Fig. 5—Percent reliability vs mileage, speedometer assembly 396

The field data and reliability curves furnished with the Failure Report and Reply form provide a complete and accurate picture of the problem at hand. At this point we have set the stage for action—Engineering now knows what the problem is and has the related pertinent information to initiate action. Perhaps this

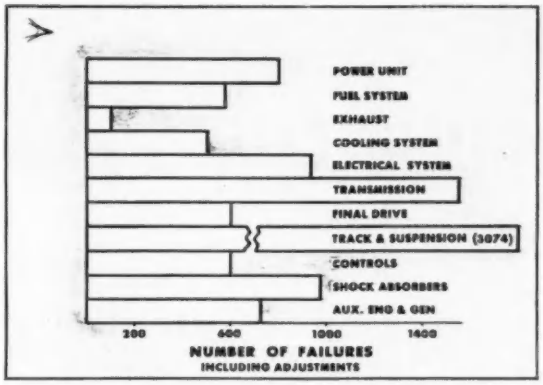


Fig. 6—M48 tank failures by component group

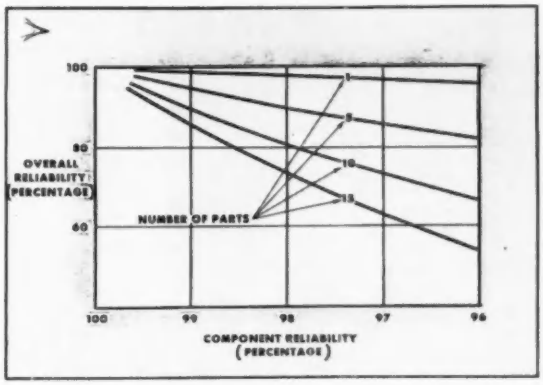


Fig. 7—Overall reliability as a function of complexity and component reliability

action is a layout investigation with subsequent Engineering Order publication. The action might be to recommend tighter inspection and control procedures at manufacturing. Perhaps the action is to provide the user with better instructions on component operation.

In any event the important thing is that action does take place—action based on actual happenings in the field—action that results in greater reliability for the vehicle.

Report of Action

Once action has been taken by Engineering, this action is noted on the Failure Report and Reply form and the information transmitted to Field Operations. There the action is put into the IBM tape which lists each failed part, the Master Failure and Action Record. If it is felt that user agencies and field engineering representatives need the information, as is generally the case, an Engineering Bulletin is also published.

Application of Reliability Data to New Design

The preceeding has dealt with the application of field data to improve the reliability of current vehicles. Data collected from the field, however, finds one of its most important uses in another area—that of new design. It is imperative that the engineer and designer know the actual performance of the current product—know its good points and especially its problems.

Without this knowledge, problems are frequently carried over into new design. If field data served no other purpose than to facilitate design of reliability into new products, this alone would more than justify the effort spent to collect this information accurately and quickly. An example of the use of field information to evaluate vehicular performance is illustrated by a study conducted recently. The next chart (Fig. 6) shows a comparison of failures by component group for the M48 tank. The data was accumulated over a period of several years. Total failures here include any failure or adjustment that required halting the vehicle, whether it involved simply tightening track end connector bolts, or replacement of a transmission. Such quantitative data serves the very useful purpose of providing a comparison and a ranking of failures according to their frequency. This is valuable.

An inoperative vehicle becomes a liability regardless of the cause and nature of the failure. However, what the chart does not do, yet what it must do to reveal a reliability story for design purposes, is to provide clues as to the relative seriousness of the failure from viewpoints other than the purely quantitative.

The story told by this chart is altered to a clearer perspective when we consider questions of repair time, expense of repair and replacement, etc. Does a particular engine failure represent the need to tighten a connection, or does it mean the entire engine must be removed and replaced? Does the failure imply the need for extensive rebuild facilities for the component? How much down-time is involved for the vehicle? Answers to such questions are most important to the designer. He is enabled thereby to proceed with a design effort based firmly on quantitized information detailing the specific nature of failures. The significance as well as the frequency of failures gives the required direction to the designer of where he must concentrate to make real gains in reliability in new design.

Redundancy

It is evident that reliability of a product can be improved by: (a) reducing the number of parts, and (b) improving the reliability of parts. This is illustrated by Fig. 7. A third method of improving reliability should at least be mentioned—redundancy.

The problem often is to decide to what degree redundancy should be considered—how many systems should be duplicated and how many components within a system should be duplicated. It seems also that sometimes designers, and users, feel more secure about a system if there is "the old with the new." For example, many research dollars may be expended to develop and perfect a new system; redundancy is required to meet the absolute safety margins. In many

(*Turn to page* 142, *please*)

TOP—Adhesive is applied by brush to enameled steel truck doors for bonding sponge rubber weatherstrip. BOTTOM —Weatherstrip is pressed into place while adhesive is still slightly wet but exhibiting some degree of tack (Minnesota Mining & Mfg. Co.).

CUTTING COSTS *with*

Automotive and Aircraft Industries Accelerate Usage of "Chemical Fastening" to Simplify Joining Problems

PART I of this two-part article which was devoted to major reasons for the use of adhesives and the basic types available for automotive and aircraft applications, appeared in the July 1 issue of AUTOMOTIVE INDUSTRIES. This second part describes in detail how adhesives are used in these two fields, gives pointers on their selection for specific requirements, and analyzes current and future trends in adhesive bonding.

AUTOMOTIVE USES

MOST of the applications now for adhesives in automotive manufacturing are for non-structural uses. In time to come, they may replace some assemblies that are now soldered, brazed, or welded. Of course, first of all the traditional suspicion that something stuck together will not hold up must be overcome.

One of the Big Three automobile manufacturers is reported to have successfully bonded numerous portions of the body on a production line basis. It is quite probable that passenger car producers will adopt adhesives more and more in the years ahead for bonded structural parts. However, it is dubious whether they will ever completely replace other fastening methods in the body and chassis.

Interior

Sizable quantities of adhesives, mostly rubber-base, are used in the modern passenger car for bonding trim fabrics to door panels and similar applications. Light-colored reclaimed rubber and SBR adhesives are popular for securing plain fabrics such as fiber trunk linings. Normally, they are in fast-drying solvents, although some water dispersions are used.

For cloth-backed vinyl and other plastic type trim materials, neoprene (along with reclaimed rubber and SBR) adhesives are used. Non-staining neoprene adhesives are used for vinyl trim, although nitrile and vinyl types are normally used for select applications. By way of an interesting sidelight, the linoleum rubber and vinyl covering for the inner cargo decks of station wagons are generally bonded with sprayable neoprene adhesives.

Rubber pads and insulating materials are bonded to the automobile roof, floor, and under the hood with reclaimed rubber and natural resin formulations in solvent or with asphalt-reclaim water dispersion type adhesives. Headliner adhesives are usually SBR-based for fabrics and neoprene-based for vinyl. Some nitrile-based adhesives are used for vinyl sheeting.

Metallized Mylar to vinyl lamination for interior trim is normally bonded with vinyl and polyester-base adhesives, although acrylic adhesives have also been used. The choice of an adhesive for this application depends largely on how much plasticizer is in the vinyl.

Flocking adhesives are sometimes used to obtain interesting decorative and functional effects inside glove and trunk compartments. Neoprene-base adhesives are generally used for this purpose, although light-colored reclaims and SBR cements have been employed.

ADHESIVE BONDING

PART II

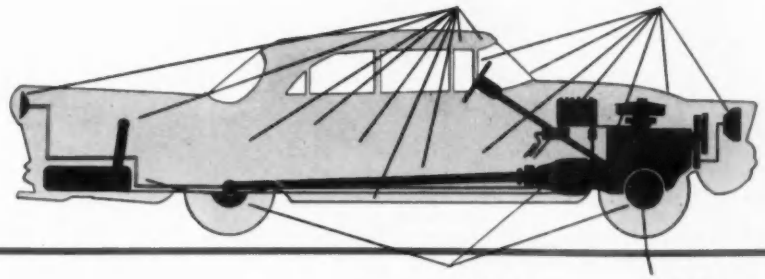
By

Andrew W. Shearer

MARKET RESEARCH EDITOR

INTERIOR AND BODY

Tail Lights
Fuel Tank Neck
Seat Springs
Foam Seating
Insulation
Trim Fabrics
Weatherstripping
Decorative Trim
Floor Pads
Carpeting
Headliners
Roof Pads
Pillar Posts
Window Channels
Drip Rails
Windshield
Body Seams
Reveal Moldings
Undercoatings
Sound Deadeners
Fender Welds
Rocker Arms
Exterior Mirrors
Headlights



CHASSIS

Brake Linings
Brake Bands (Auto. Trans.)
Clutch Plates (Auto. Trans.)
Clutch Facings (Manual Trans.)

ENGINES

Gaskets
Oil Filters
Piston Rings
Block Sections, Aluminum

Typical Applications of Adhesives Coatings and Sealers in a Passenger Car

Flocked rubber channels for windows are usually bonded with a heat-curing, reclaimed butyl rubber adhesive.

Foam seating is bonded in manufacture and repaired with a neoprene adhesive and bonded to cloth trim with reclaim, SBR, and neoprene adhesives. The foam cushions are also bonded to the metal frame with reclaim adhesives. Seat springs are sometimes coated with a butyl base compound to make them non-squeaking.

Body

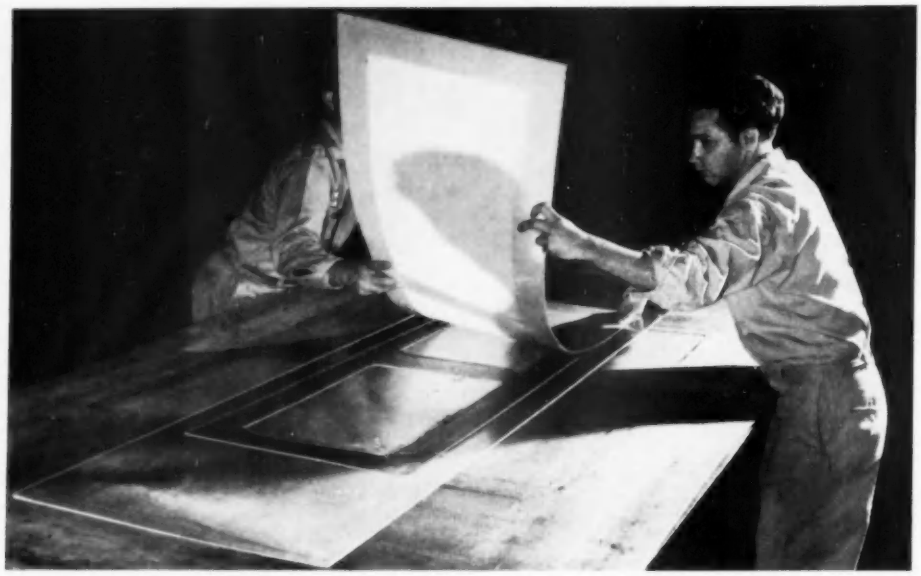
The neoprenes are the most popular adhesives for bonding sponge or solid rubber weatherstrip to lacquered or enameled metal doors and frames. Other weatherstrip bonding applications include windshields, ventilators, deck and trunk lids, etc. Rubber window channels are bonded to metal with neoprene adhesives, although some reclaim-based materials are also used.

Pressure sensitive tapes used in two-tone color painting of automobiles are usually based on natural rubber, although SBR is added in some adhesive formulations. Exterior mirrors sometimes use reclaim-base adhesives to attach the glass to the metal backing.

Epoxy-polyamid formulations are used to repair dents and surface imperfections on automobile bodies as a replacement for solders. Repair shops ordinarily use these polyamids as well as vinyl and nitrile rubber-base metal fillers.

Epoxies of the resilient type are now being used by some automobile manufacturers to seal around windows. These flexible materials are ideal for the purpose because they bond so well to glass and metal. The epoxies are also being evaluated for

Plastisol material is used to seal automobile roof-body joint against leakage in this drip rail application by an extrusion gun. The plastisol is put on the white metal after it has been bonderized, and the prime is applied over the wet plastisol. The plastisol is fused as the prime is baked in the prime ovens (Armstrong Cork Co.).



Flymaster V-2 dry adhesive in film form using Hycar (B. F. Goodrich) nitrile rubber is employed at Strick Trailers Div. of Fruehauf Trailer Co., to bond plastic skylights to aluminum roof sheets. The film adhesive can be reactivated with common solvents, heat or pressure to achieve tensile strengths as high as 1500 psi (Rubber & Asbestos Corp.).

TABLE I

PROBLEM ANALYSIS FORM*

1 WHAT MATERIALS ARE BEING JOINED?

MY APPLICATION IS TO:

☐ BOND _____

☐ COAT _____ to _____

☐ SEAL _____

☐ POT _____

Please be specific — say "aluminum to foamed styrene" NOT "metal to plastic." Submit samples if possible.

2 WHAT ARE THE END-USE SERVICE REQUIREMENTS?

MY ASSEMBLY WILL BE EXPECTED TO WITHSTAND:

A. Temperature extremes of _____ °F ☐ continuously ☐ intermittently

B. These chemicals or solvents _____ ☐ immersion ☐ vapor

_____ ☐ continuously ☐ intermittently

C. These conditions: ☐ moisture ☐ sunlight ☐ outdoor weathering

D. Color requirements: _____

E. These loads: (Describe amount and type of strength required. Sketch, if possible)

_____

_____

3 WHICH PRODUCTION METHOD WILL BE USED?

A. I prefer the following form of adhesive: ☐ liquid ☐ paste ☐ film ☐ powder

B. This will be ☐ hand ☐ machine application.

C. My equipment makes it desirable to use:

☐ brush ☐ knife or trowel ☐ spray ☐ roll coater

☐ extruder ☐ caulking gun ☐ other _____

D. These are my application requirements:

Viscosity desired: _____ Curing time available: _____

Drying time required: _____ Pressure available: _____

Curing temp. available: _____

E. If necessary, we ☐ can ☐ cannot use a 2-part adhesive.

ESTIMATED MONTHLY VOLUME: _____

SEASONAL: ☐ NO ☐ YES

PRICE LIMITATIONS: _____

PRESENT PRODUCTS USED: (Samples if possible) _____

_____

WHY UNSATISFACTORY: _____

_____

_____

REMARKS: (Use Reverse Side, if Necessary) _____

_____

_____

_____

_____

SIGNED _____

TITLE _____ DATE _____

FIRM NAME _____

INDUSTRY _____

ADDRESS _____

CITY _____ STATE _____

*Rubber & Asbestos Corp.

bonding decorative metal trim to automobile bodies. A big advantage in this application is the elimination of dimples on the surface of the metal caused by spot welding.

Already widely used in the aircraft field, the epoxies appear to have an excellent potential in automotive applications. Such problems as pot life, handling characteristics, and labor costs are steadily being overcome with the introduction of automatic mixing and dispensing equipment.

Coatings and sealers, first cousins of the adhesives and compounded of many of the same basic materials, are also used extensively on automobile bodies. For example, asphalt and asphalt-reclaim rubber-based sealers are used to seal body seams along rocker arms, pillar posts, around the windshield, and wherever else there is any chance along seams of the body for water or dirt to enter. Wherever seams are spot welded, an oil base sealer is used between the mating materials, and the metals are spot welded through the sealer.

The sealer used around the neck of the fuel tank is nitrile rubber-based as a general rule. Butyl and polybutene sealers are used to seal

convertible tops, behind the reveal moldings, as general purpose thumbing type sealers around the roof and floor seams, and around the windshield. Vinyl plastisol base sealers are used along drip rails, fender welds, and along the pillar posts. A primer, usually a modified vinyl base type, is usually needed for these applications.

Some sealers are previously extruded so that they can be applied in the exact shape needed on the job. Some have a swelling ingredient incorporated into the product. When the sealer is passed through the baking ovens, it swells from 50 to as much as 150 per cent to plug and seal the opening completely. The automobile manufacturer is thus able to permit greater tolerances in the shaping and forming of the joining parts. Most of these expandable sealers are reclaimed rubber (either natural or butyl).

Decorative trim on the exterior as well as the interior of an automobile is usually protected with a thin strippable coating during the drawing, shaping, and forming operations. The coating is removed by hand stripping or buffing prior to attaching the strip to the car.

Coatings, usually asphalt-base, are used on the underside of the car to protect it against corrosion and salt, while sound deadening coatings are used on the inside of doors, fenders, trunk lids, hoods, and other strategic spots. Thin anti-corrosive coatings, generally asphaltic-base also, are used to protect small parts in the radio aerial, heater, and other accessories which are exposed to occasional water splash and high humidity.

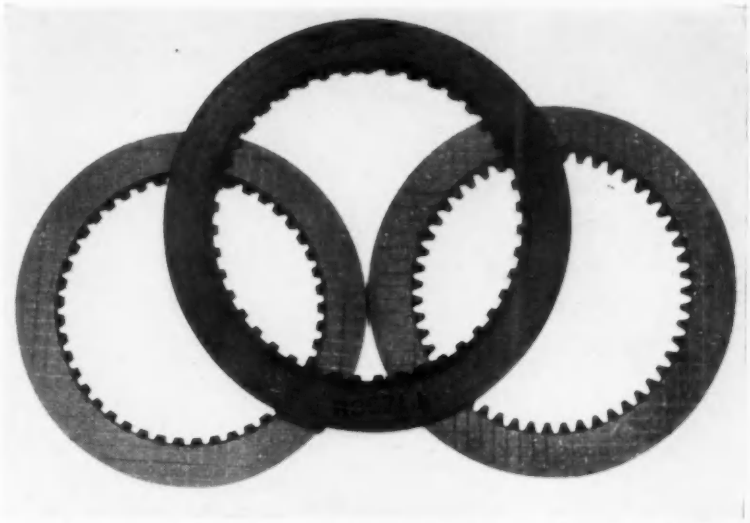
Chassis

By far the largest application for adhesives in the chassis is the usage of nitrile-phenolics to bond friction material to metal in automatic transmission brake bands and clutch plates and brake lining to brake shoes. Consumption of adhesives for these purposes mounts to staggering proportions.

Where gasketing must temporarily hold to pans or stamped metal parts prior to assembly, butyl-base pressure sensitive adhesives are used. The gaskets are normally cork and felt.

Unitized piston rings are often held together with a reclaimed adhesive (must be oil soluble). In oil filters, the resin impregnated paper bonded to itself and to paper or metal end caps is usually attached with nitrile-phenolic adhesives. Oil filters which have a gritty anti-slip coating are normally coated with a vinyl base or nitrile base compound.

Automobile manufacturers are known to have been experimenting with adhesives for bonding sections of aluminum engine blocks. New adhesives with heat resistance running into the 400 F temperature range are being used for bonding the sections.



Automatic transmission plate consisting of sandwich with friction material on either side and metal in the center. Each piece of friction material is spray bonded to the metal with each transmission using four to 11 such plates (Adhesives Dept., Raybestos-Manhattan, Inc.).

AIRCRAFT USES

Adhesives for the aircraft industry have a wider usage today than ever before and are expected to have a great potential in future designs. They offer many advantages from the viewpoint of weight savings, aerodynamic smoothness, integral strength, etc.

New elastomeric thermosetting adhesive films are used extensively for bonding leading and trailing edges of aluminum aircraft wings and helicopter rotor blades. These adhesive films are also used in the assembly of other metal-to-metal parts as primary and secondary structural parts in aircraft such as compartment bulkheads, floors, rudder and aileron members.

High-strength structural adhesives are used in the construction of wing panels and for the attaching of skins, making spars, webs, and other heavy members stronger, lighter in weight, and more economical.

Epoxy, vinyl, and phenolic adhesives or combinations thereof are used in the bonding of the honeycomb to the panel on double-skin honeycomb panels. The epoxies in this case can be used as liquids or as preformed sheets. When used as edge sealers on honeycomb panels, the epoxies are normally filled with low density materials.

The versatile epoxies have many other aircraft applications. They are used, for example, in the making of disposable fuel tanks, the

Plastilock adhesive tape is applied here to an interior panel for installation in the Lockheed Electra. When applied and cured under heat and pressure, it has a standard shear strength at room temperature of 4000 psi. Adhesion of the two metal parts will provide a bond stronger than the metal itself (B. F. Goodrich Industrial Products Co.).

This wing segment for the Convair B-58 Hustler is just one of the many sections of this supersonic aircraft bonded with Epon 422 epoxy-phenolic adhesive tape. The sandwich panel of aluminum skins bonded to glass fiber honeycomb core results in weight savings, uniform stress distribution, elimination of blind riveting, and higher structural strength (Shell Chemical Corp.).

bonding of fiberglass ducting, and the bonding and sealing of aluminum skin to aircraft assemblies. They are also formulated as aluminum colored paste to be used for the field repair of aircraft skin.

Oil-resistant neoprene or nitrile rubber-base adhesives are used to bond neoprene tubing, sheeting, foam, and gaskets to themselves and to plastic and metal surfaces in the aircraft industry. Water and weather-resistant reclaimed and SBR rubber-based adhesives are used to bond felt, fabric, wood, asbestos, and paper to themselves and to aluminum surfaces.

Special purpose adhesives, such as the rubber-resin types, are widely used in aircraft manufacturing for bonding cured nitrile rubber patches to cured nitrile liners in both self-sealing and collapsible fuel cells. Another example of the use of rubber-resin based adhesives is the bonding of a nylon barrier in self-sealing fuel cells to the natural rubber or SBR sealant.

Some rubber-resin adhesives (especially phenolic-elastomer types) act as sealers and make it possible to build aircraft in which each seam, rivet, and crack in the wing is filled with a fuel-resistant material. The wing then becomes an integral fuel tank.

SELECTION OF ADHESIVES

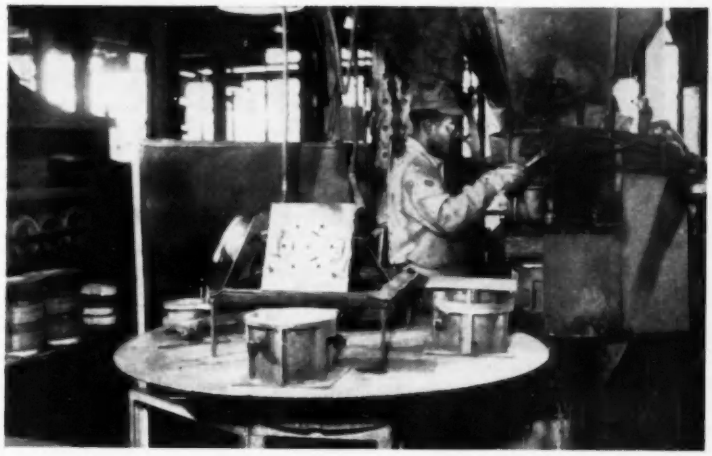
The selection of an adhesive for a particular application is not a matter to be approached on a haphazard basis. Certainly, the first considerations involved in choosing a specific adhesive must be: 1) What are the materials to be bonded? 2) what are the desired properties of the adhesive required to do the job; and 3) what method of application is most suitable?

Complete data on all three factors should be available. It should then be possible to select the desired form of the adhesive—liquid, paste, powder, or film—along with its method of application—brush, spray, trowel, roller coat, knife coat, dip, extrusion. Attention must also be given, of course, to production scheduling problems, equipment to be used, heat and pressure requirements, etc.

To be sure, cost is an important consideration in selecting an adhesive, but it should by no means be paramount. As in many other situations, the "best" adhesive is the one that will do the best job at the lowest possible cost. As a general rule, cost goes up as bonding strength increases. Therefore, the maximum strength of the bond required should determine the cost of getting the right adhesive. There would be no point in throwing money away on an adhesive made to provide higher bonding strength than required. On the other hand, it would be foolish economy to use an adhesive whose bonding strength was far below that required.

Such physical characteristics as tension, sheer, peel, impact, vibra-

(*Turn to page* 131, *please*)



The silicate cores are blown on a standard core-blowing machine

Dry sand molds move toward the pouring station

Gas Hardened Cores Simplify Foundry Operations at International Harvester Plant

By Kenneth Rose
MID-WEST EDITOR

By changing certain mold-making procedures in the casting of track idlers for crawler tractors, International Harvester Co. is showing substantial savings in its Construction Equipment Division. Additional applications of the process are being studied by Harvester engineers.

The change was made as a result of studies of the process at the Milwaukee Works, a part of International Harvester's Construction Equipment Division. The studies were supplemented by work done at the company's Manufacturing Research facilities in Chicago.

Track idlers were made in four sizes ranging from 5½ in. to 9 in. in diameter and 6 in. to 9 in. in height as gray iron castings in dry sand molds. Each mold was assembled from six cores, with two chill rings inserted to harden wear surface of the casting. The mold consisted of a top and a bottom slab, a cope and a drag body core, a ring core, and a pouring dish, in addition to the chill rings. Of these, only the ring core was blown. All the others were hand rammed.

The six cores for each mold were made of oil sand in a separate coremaking department on the floor above the molding department. After being formed in the core boxes they were baked, pasted together, dipped if necessary, loaded onto trucks, and run down to the moulding level on an elevator, then moved to storage until required. It was estimated that there were up to 63 separate operations in core making and handling. Operations required a great deal of floor space also.

Studies were made of the possibilities of using cores with a silicate binder, hardened with carbon dioxide gas. Results were satisfactory, and the studies were then turned to redesign of the cores themselves. It was found that the six cores forming the dry sand mold could be combined into four, and that all of these could be blown instead of being hand rammed. The cope and drag body cores were combined, and the top slab and pouring dish were combined, leaving only the bottom slab and ring core as they were. Washed and dried silica sand of 60 AFS fineness was used for uniformity.

In the present process, the sand is mixed with the binder, raw sodium silicate, using about 2½ per cent of binder. Mixing is done in a conventional oil sand Simpson mixer. The core mixture is then blown into core boxes at the pressure usual for oil sand mixtures, 90 psi. The core boxes used have screened vents at the bottom, and through these carbon dioxide gas is fed into the sand from a bulk storage unit. During the development stage the gas was supplied from several 50-lb cylinders. There is a time-pressure relationship in

(*Turn to page* 113, *please*)

PART II

Single-joint swing axle, common to all Mercedes cars, has a low pivot point for improved tire adhesion during wheel deflection. It is formed from two main sections, with the left-section combining the differential and final drive, and the right one the universal joint and spline on the half-shaft.

Advanced Production Methods for Daimler-Benz Cars

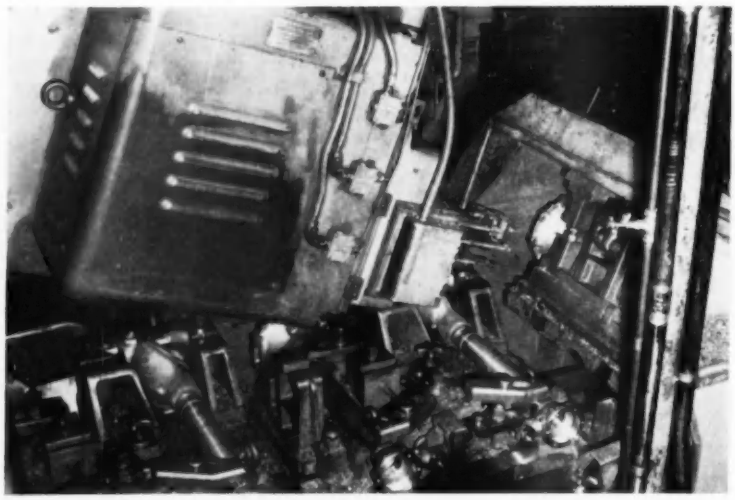
Automated Machining for Axle Components and Engine Blocks Are Highlights at Daimler-Benz Stuttgart Plant

THE single-joint axle used for independent rear suspension on all Mercedes cars is interesting from a design as well as a production standpoint. Developed from Grand Prix racing experience and introduced in 1954, the axle is in two main sections—one combining the differential and left-hand tubular casing, and the other the universal joint and the right-hand casing.

The two are joined by a trunnion extending downwards from the joint housing. This swivels on a pin offset from the centerline of the drive pinion, but midway between the two wheels. Midpoint of the axle assembly is attached to the frame-floor of the car by a single vertical bearer shaft that supports the two halves on the same central pin.

This construction provides an axis of vertical rotation closer to the ground (and hence to the tire-road contact point) than with conventional swing axles having a rigid differential. The low pivot point for the half-shafts thus minimizes wheel cant and tire scrub during deflection, thereby reducing tire wear and loss of adhesion.

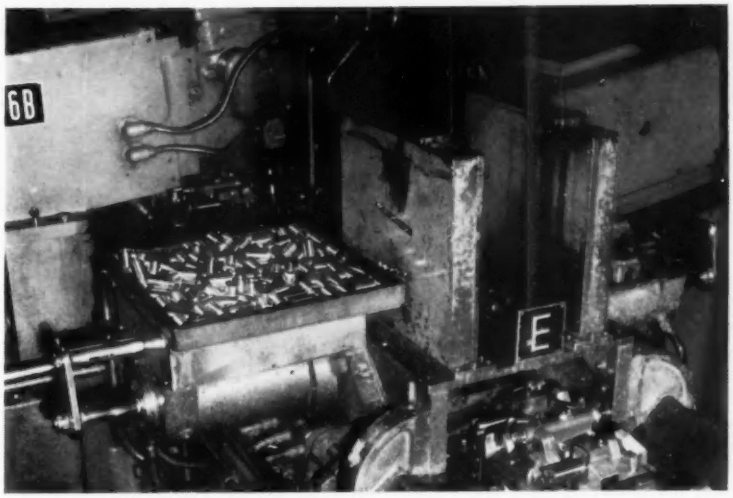
Production of the axle is more complicated, however, as the two casings are dissimilar, while a sliding splined joint is required for one of the half-shafts (since the



Transfer line for half-axle casings tilts the platen at one station for drilling, reaming and tapping a pair of awkwardly-located holes, thereby avoiding work repositioning. A hydraulic ram overhanging the center bed lifts one end of the platen while the other end pivots on pins inserted from both sides. Tool slide and the angled head index vertically between the three operations.

Bronze bushings are pressed into the swivel pin bores near the end of the front-axle line. Opposed horizontal rams are preloaded with bushings fed from individual zig-zag magazines, and then press them home with synchronized strokes.

By David Scott
Special European Representative
For AUTOMOTIVE INDUSTRIES



pivot point is not on its axis). Shaft housings are fabricated by welding the inboard and outboard casings (spline housing and yoke, differential face, and brake-plate flanges) to the central tubular members. Produced at the Unterturkheim plant of Daimler-Benz, these assemblies are common to the entire range of Mercedes cars except the 300 models.

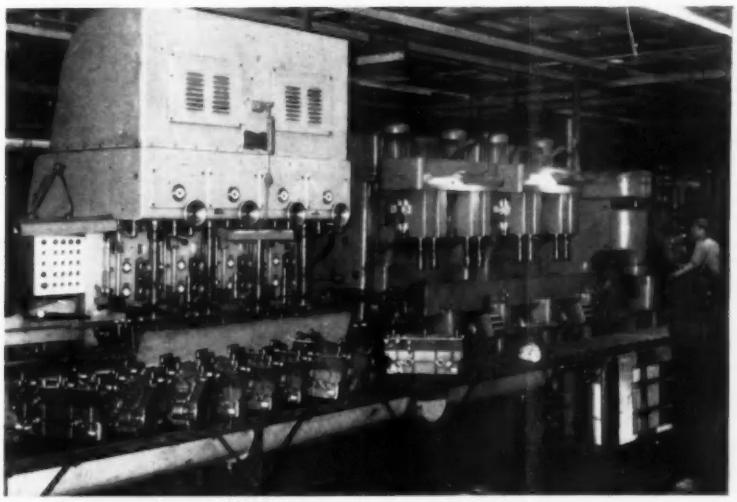
After milling the flange faces to length, the two units are machined in pairs on a Burr platen-type transfer line with nine work stations, most of which are double. Work is mechanically clamped in the parallel fixtures, and operations cover boring, finish boring, drilling and reaming both ends with fairly conventional tooling.

One unusual feature of the line is at the last station where two small holes are drilled, reamed and tapped in the differential mounting flange. These take the breather plug and bearing set screw, and lie on the *side* of the casting as it is then located in the fixture. In order to avoid work-repositioning for this operation, the entire platen is tilted upwards to expose the required area to an inclined head with an indexing tool slide that overhangs the line.

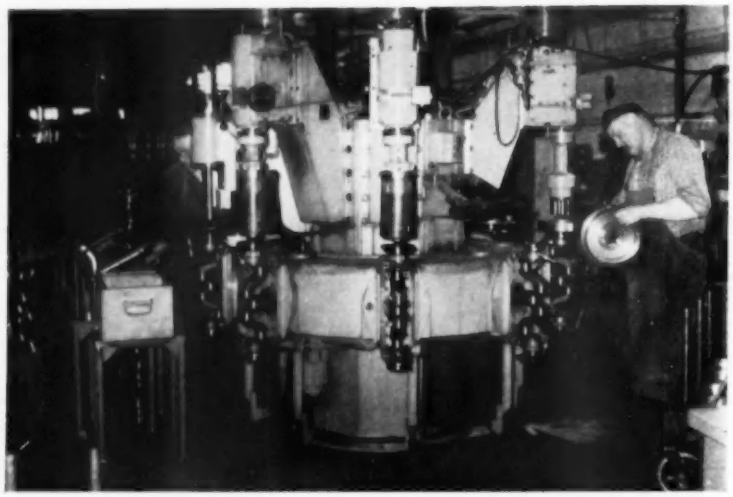
As the platen moves into this station, a C-shaped extension on the top of its trailing end engages the inverted "T" on the bottom of an overhead hydraulic ram supported on an angled bridge. Meanwhile, opposed horizontal pins on each side of the bed enter mating sockets on the leading end of the platen. The platen then swivels on these pins as the ram elevates the other end against location faces on the underside of the bridge to align the work with the tools.

Now the head feeds in, with the tool slide at the top of its vertical travel for drilling the two holes. Feed motion is on the main head slide, and after drill withdrawal the tool slide indexes down to the second position for reaming and spotfacing. At the third position, however, feed for tapping is controlled by a lead screw that extends the quills on these two spindles.

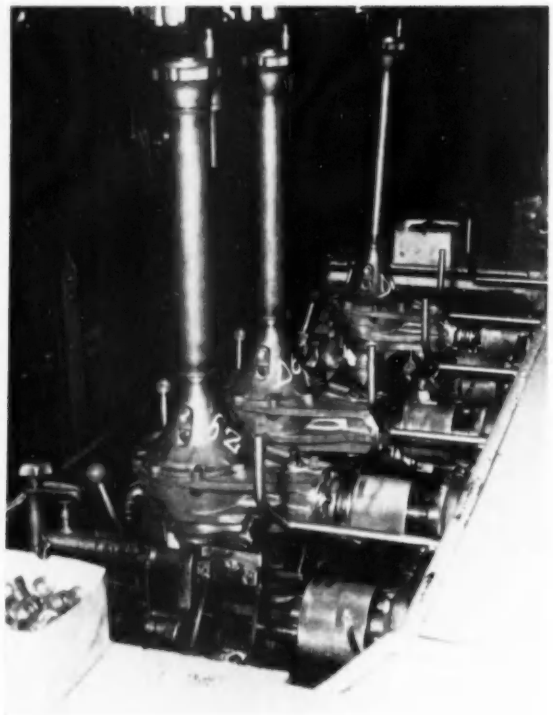
The platen is then lowered to the track, released, and moved on to the end of the line by an elevator and overhead conveyor. Output of this line with two operators is 15 pairs of casings per hour. Since this is not sufficient to meet the car production, the old single-machine line is still in use, employing 13 men to turn out the same number of parts. *(Cont'd on next page)*



Final 9-station automatic section on the engine block line has the transfer mechanism linked to the Daimler-Benz vertical miller (extreme right) that skims the head face. Alternate pairs of cylinders are bored in two stages on the 8-spindle Burr machine in the center. Bores are then finished on the Nagel 4-station honer.



Crankshafts are assembled by two men on this 8-position machine built by Daimler-Benz that combines automatic, power-assisted and manual operations. Swiveling fixtures are carried on a ring that circulates counter-clockwise beneath the vertical heads on the stationary column.



After assembly, right axle-halves are motored and flushed on this rig built by Daimler-Benz. The unit takes five components at once, and the pinion shafts are automatically engaged by a sliding coupling that extends as each electric motor is started.

Following the Daimler-Benz policy of strict quality control at Untertürkheim, every second or third piece coming off these lines is gaged on its critical dimensions to check tool condition. Each component is also visually inspected, and at the time of this visit the writer noted one axle casing that was being rejected because of a very small air pocket in one of the machined internal diameters, even though this was merely a bearing seat unrelated to sealing or motion.

Rear axle halves are assembled on two separate lines with trolley-mounted fixtures. A point of interest on the right-hand line is the use of roller bearings on the spline segments of the half-shaft sliding joint. At the end of the left-hand line the units with completed differential are motored and flushed out for three minutes on an electrically-driven rig with independent spindles for five components. The two sections are then stored on monorail conveyors which converge on the final axle assembly line where they are mated.

Front swivel axles are machined on a Hüller automatic transfer line with an hourly output of 44 pieces. Although this has 16 work stations with many of them double-sided, only 17 independent heads are required, since the workpiece is small and the heads with multiple tooling sometimes span two or three platens.

Castings reach the line with the wheel-side already machined—i.e., the mounting flange faced and the spindle turned and its radius rolled. Work is positioned spindle-down in the fixtures, which are power-clamped by external drives and dog clutches at the loading station. The fixtures are designed to take left-hand and right-hand axles, and all tooling for the integral steering arm (covering, boring and facing the ball-joint socket and milling the limit pad) is duplicated so that no alterations to the line are required when changing from one type to the other.

The main operations on the work areas common to both parts include: drill the swivel pin bore from both sides in three stages; turn and mill the two bore faces; bore and ream the bushing seats; gage seat diameter; drill and spotface the mounting flange; and drill, probe, tap and internally deburr the grease fitting hole.

After the swivel pin bores are finish-machined the bronze bushings are automatically inserted in each end at a press station that straddles the line. Bushings are fed from a pair of vertical zig-zag magazines that carry them to the loading mechanisms facing the horizontally-opposed hydraulic rams. The arrival and clamping of a platen actuates the electro-hydraulic circuit that operates the

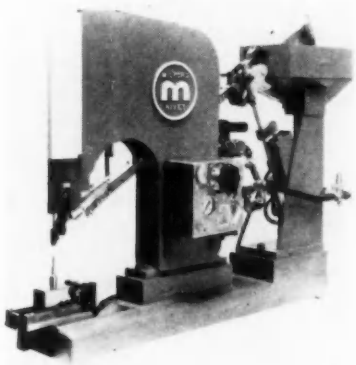
(*Turn to page* 124, *please*)

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Pneumatic Riveter

THE *Milford Rivet & Machine Co.* announces the development of Model 56-BH which embodies a narrow cross-sectional area of machine front, allowing for single or multi-spindle arrangement. Attachment of blade hopper permits straight in-line



Milford pneumatic riveter with blade hopper attachment

feed of difficult to feed parts such as long tubular rivets, collar studs, and threaded or knurled parts.

The setting machine portion is actuated by a pneumatic cylinder that drives the setting tool through toggle linkage. The blade hopper is independently driven through a separate air cylinder. The hopper system may be continuously cycled or operated intermittently. Both drives operate from a single air and lubricating control off shop air from 60 to 150 psi.

Circle 30 on postcard for more data

Hydraulic Power Unit

THE *F. Jos. Lamb Co.* hydraulic quill type power unit is designed for maximum versatility of application and maximum economy through the use of standard components.

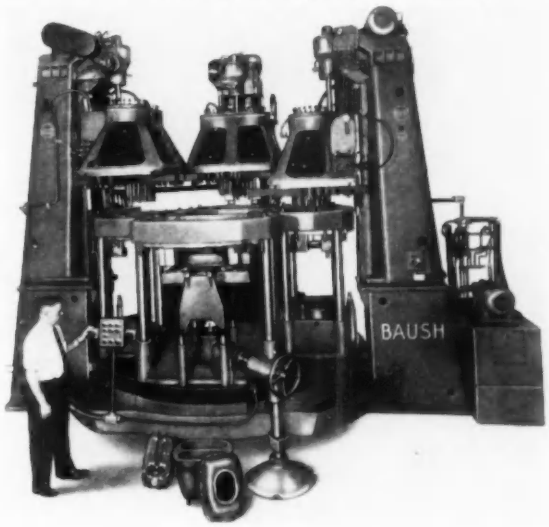
The unit rotates and feeds drills, reamers, counterbores and spotfaces either singly or in multiple. Within its power capacity it can be used as a prime mover or driver to perform boring, milling, and similar operations.

Circle 31 on postcard for more data

Leadscrew Feeds for Drilling, Tapping, Reaming

The use of mechanical leadscrew feed for drilling, tapping, and reaming is featured on M-20 machines. Illustrated is a machine tool developed around three M-20 units. It is equipped with a 124 in. diameter table with four indexing stations. The three spindle units have 27 by 40 in. heads, featuring automatic cycling; a semi-automatic cycling for low production, and a jog cycle for setup. Feed can be varied from 0.005 to 0.090 in. per revolution and spindle speeds from 130 to 1050 rpm. (Baush Machine Tool Co.)

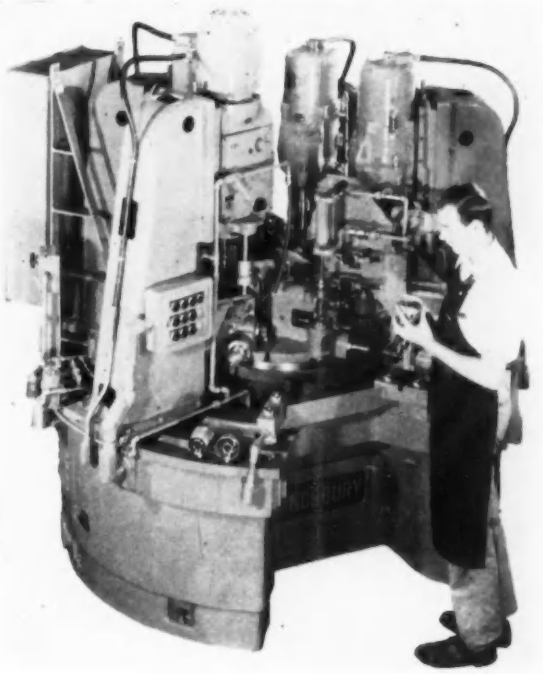
Circle 32 on postcard for more data



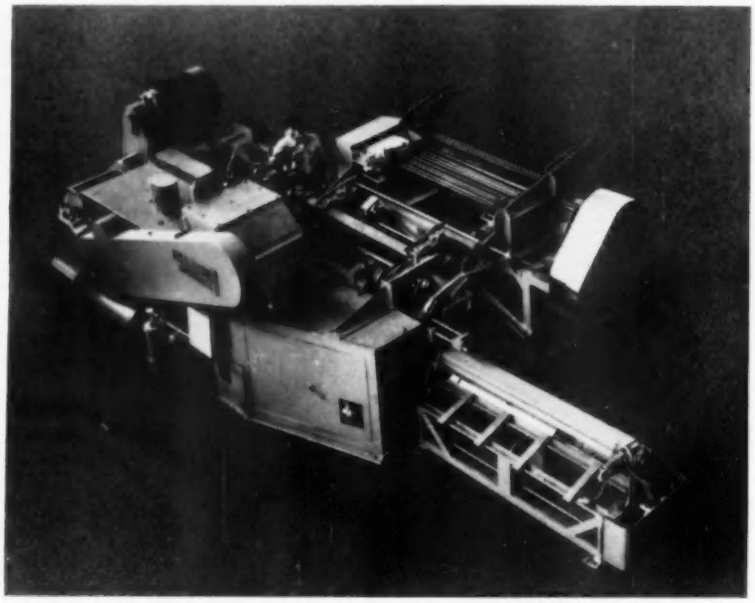
Multi-Unit Automatic Performs Six Operations

This multi-unit automatic performs six operations from three directions on control lever housings for automobile transmissions. Six units face, chamfer, drill and ream at a rate of 465 parts per hour. A 30 in. index table holds five work fixtures. The part is located in the fixture over an expanding arbor. Rotative location is taken from an inside slot. There are four vertical units—the first faces and chamfers the center hole, the second drills a 0.438 hole, and the last two step drill and ream a third hole. Two horizontal units operate 90 degrees apart to drill a hole through two walls. (Kingsbury Machine Tool Corp.)

Circle 33 on postcard for more data



NEW PRODUCTION and PLANT EQUIPMENT



Hill Acme fully automatic forging machines are built in 1¼ to 5 in. capacities

Fully Automatic Forging Machine With Induction Heater

THE *Hill Acme Co.* has designed a fully automatic forging machine, integrated with an induction heater. The machine illustrated is producing ⅝ and ¾ in. bolts in lengths from 12 to 72 in. at the rate of 45 per hour. The rods, already threaded at one end, are loaded into the feeding rack where an index feed, chain driven, positions them for proper spacing through the induction furnace.

As the rod ends are heated they are delivered, at the proper timing cycle, to the forging machine by a roller chain feed where they are gaged for length, picked up by fingers and passed progressively through the four position die. The finished forgings are discharged from the back of the machine by means of a separately driven conveyor, arranged for both right and left hand discharge.

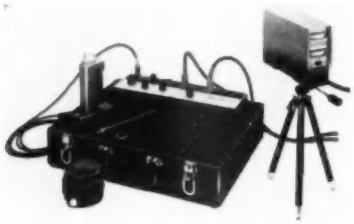
Circle 34 on postcard for more data

Portable Balancer

DESIGNED for ease of operation, this precision portable balancer has been designed by *Stewart-Warner Corp.*

Highly sensitive, the instrument is adjustable to any job from below 10 millionths of an inch to over 1/10 to ¼ in. amplitude of vibration. The unit is suited for eliminating vibration in grinding wheels and cutter heads for fine finishes and close tolerance work; and detects vibration caused by worn bearings, belts and misalignment.

In operation, the amplitude of vibrations of the part under test are electromagnetically converted into electrical impulses by the vibration pick-up unit. These impulses are then amplified in the electronic unit which triggers a strobe light to "freeze" the image of the rotating part, pin-pointing the trouble source. The angle of unbalance is indicated through the stroboscope and the amount of vibration appears on an easy-to-read meter.



Stewart-Warner precision, portable balancer

Circle 35 on postcard for more data

Degreasing Agent

NO-TOX is a new degreasing agent which is said to combine the cleaning characteristics of carbon tetrachloride with low toxicity. It has the same MAC rating as isopropyl alcohol and dries quickly.

The product is non-flammable, and can be used in any type of degreasing operation with the exception of vapor phase degreasing. *Electro-Chemical Products Corp.*

Circle 36 on postcard for more data

Thread Rolling Head

A NEW revolving type thread rolling head has been developed for application to Landis automatic forming and threading machines and 4-spindle semi-automatic threading machines. Named the No. 7 TRP, it has a 7/16 to ⅞ in. U.N.F. and U.N.C. range.

Of "pull-off" design, the device is automatically opened by the forward travel of the machine's threading spindle. For closing, a cam shoe actuates the head's operating ring as the machine's spindle is withdrawn after rolling. Sufficient overtravel has been incorporated in the closing mechanism to guard against malfunction and also to reduce wear. *Landis Machine Co.*

Landis thread rolling head

Circle 37 on postcard for more data

Automatic Machine

COMPLETELY automatic loading, drilling, fixture indexing and unloading of planet pinnion carriers is performed by a new high production machine, the Model 328-S, made by *The Morris Machine Tool Co.* The eight station machine uses a 30 in. diameter horizontal rotating table to process 600 parts per hour.

Circle 49 on postcard for more data

Tool Radius Checker

PRECISE measuring of tool nose radii is achieved on the new Monarch precision radius checking instrument. It consists of a main frame, a means for holding and positioning the measuring head and a means for mounting and adjusting the tool. Also required is an electronic checking device. The Monarch checker may be equipped for the recording of tool contours on a direct reading oscillograph. *The Monarch Machine Tool Co.*

Circle 38 on postcard for more data

Versatile Air Tool

THREE tools in one — drill, screwdriver, and nut runner—is the result of new lines of pneumatic products introduced by *Cleco Air Tools.*

The tools are incorporated in the No. 10 series pneumatic screwdrivers and No. 10 series drills. Complete interchangeability of parts between the series enables each of these basic tools to perform multiple jobs.

Cleco highly versatile air tool

Cleco air motors power both series. All gear reductions use three-idler planetary gear trains, bushed for extra-long wear.

Circle 39 on postcard for more data

Outdoor Fork Trucks

THREE heavy capacity pneumatic tire fork trucks for outside handling work over piers, unpaved yards and similar areas have been introduced by *Clark Equipment Co., Industrial Truck Div.*

All three machines are powered by a six-cylinder Continental gas or LP gas engine of 244 cu-in. displacement, coupled with a two-speed, full power shift transmission. A synchronized three speed manually shifted transmission is available optionally.

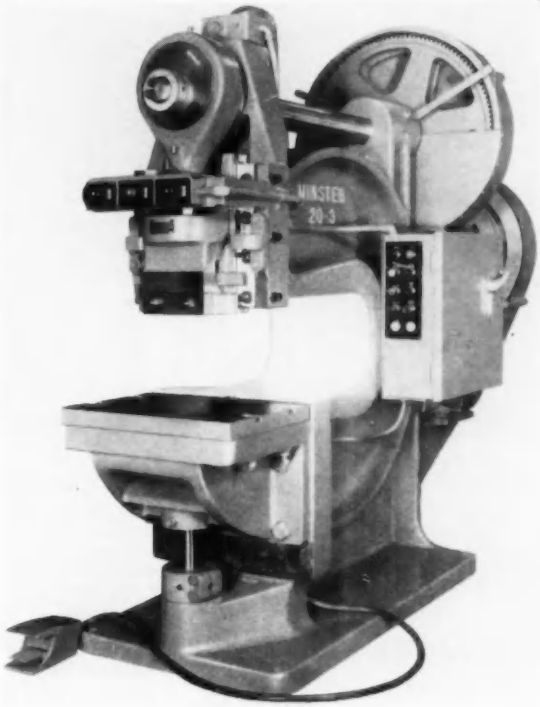
Directional controls and lift controls are mounted on the steering column within fingertip reach of the operator. A split hood over the engine provides complete accessibility for maintenance.

Circle 40 on postcard for more data

Deep Throat Type Punch Press

Series 20 deep throat type punch presses with capacities of 15, 25 and 35 tons for light and medium punching, cutting and flanging on large pieces, are offered by the (Minster Machine Co.) The press features a heavy section "C" type one-piece, high alloy cast iron frame which forms a deep throat that allows punching to the center of a 60 in. circle. Two extra long, accurately ground, removable gibs guide the slide. Standard slides have removable slide punch caps and crossbar knockouts Single gearing is available to provide slower operating speeds. Cast iron main gears with H section spokes and steel pinions are standard. The presses can be equipped with an adjustable bed when varying die space is needed.

Circle 41 on postcard for more data



Machines for Electronic 3-Dimensional Machining

The Elox Corp. of Michigan announces a new series of electrical discharge machine tools. Designed for precision, this rugged machine tool is being used to produce extrusion dies, powdered metal dies, cold heading dies, blanking dies, multiple pierce dies and three dimensional cavities. The series can use any Elox vacuum tube or RC power supply. The RP-100 series features: electrical mechanical power feed or hydraulic power feed, precision locating devices and precision electrode holding devices can be furnished, work table surface of 7 by 17 or 12 by 18 in. of precision cross feed construction, and can be supplied with end measuring rods or optical measuring devices as required.

Circle 42 on postcard for more data

Numerically Controlled Precision Turning, Boring Unit

The new Heald Bore-Matic precision turning and boring machine which is equipped with a Bendix numerical control system will produce hemispheres, cylinders, free form turned shapes and other related type hollow metal parts to extremely close tolerances. (Bendix Industrial Controls Section, Bendix Aviation Corp.)

Circle 43 on postcard for more data

Inspection Air Gage

A COLUMN-TYPE Precisionaire dimensional inspection air gage with 15 in. of gaging range has been designed by *The Sheffield Corp., a subsidiary of Bendix Aviation Corp.*

Designated the Model 1500 Series long-range Precisionaire instrument, the gage has a full 15 in. linear column and scale with amplifications up to 100,000 to 1. It was developed to meet the need for gaging broader dimensional tolerances at high amplification.

Circle 44 on postcard for more data

Automatic Clutches

A NEW series of automatic clutches designated 600 Series, is available in seven standard models for the lower hp range. Able to handle loads and operate under difficult conditions, the 600 Series has such features as; sealed ball bearings, rapid cooling, full 360 degree lining, minimum of parts, easy servicing, complete drag-free release at idling speed, and extra capacity to assure no-slip transmission of full engine power at operating speeds. *Salsbury Corp.*

Circle 45 on postcard for more data

Comparator Lamp

Now available for use with all J&L 14-in. screen and 30-in. screen optical comparators is a mercury arc lamp light source unit. It is said to provide more than five times the intensity of the best filament light source, thus producing greatly improved definition of image.

The unit comes as a package, and its control element measures 3 by 2½ by 1½ ft. It can accommodate various standard makes of mercury arc lamps, is safeguarded by a system of interlocking limit switches, and is self-cooling. The light can be filtered for use at low magnifications. *Jones & Lamson Machine Tool Co.*

Circle 46 on postcard for more data

Masking Coating

A PROTECTIVE COATING, known as CMS-N-202, has been developed for sealing metal and stainless steel surfaces against the biting and cleaning effects of pickling and passivating. It is also usable to protect areas from being plated.

The material can be applied by brushing on, with spray gun, stencilled on, dipped, or other conventional method of application. It requires no mixing and no additives, and is ready for use as it comes from the container. Stripping after processing is said to be easy. *Consolidated American Services, Inc.*

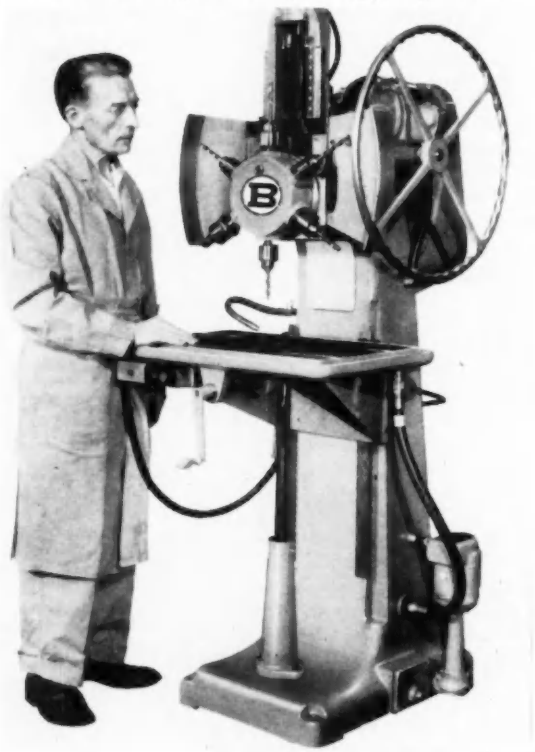
Circle 47 on postcard for more data

(*Turn to page* 114, *please*)

Six Spindle Turret Drilling, Boring, Tapping Unit

New improvements for the 1C Model ⅜ in. diameter drill capacity in steel are a new transmission and clutch assembly, which drives the six spindles. The turret head is counterweighted by an easily adjustable coil spring to provide a sensitive counterbalance for the turret and slide regardless of the weight of tooling mounted in the turret head. The spring can be set so that it returns the slide to the top of the stroke or so that it just counterbalances the weight of the slide and head. This reduces operator fatigue and results in more work per shift. New gibs are provided that maintain greater accuracy for long periods of time. Twelve preselective spindle speeds ranging from 325 to 4050 rpm are provided. (Burg Tool Mfg. Co.)

Circle 48 on postcard for more data



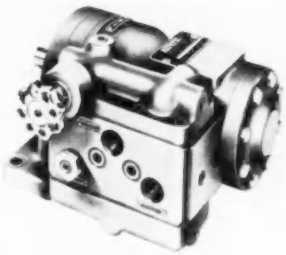
NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Two-Volume Pump

A two-volume pump, requiring only a single pressure setting for both unloading and maximum pressure, has been announced by *Vickers Inc.*

The pump prevents excessive heat



generation and wasted horsepower by automatically maintaining system pressure with a small volume pump while a fixed differential between the relief valve setting and the unloading valve allows return of large volume pump capacity to the reservoir at negligible pressure.

These pumps are recommended by the maker for 1000 psi at 1200 rpm in the small volume operation and up to 750 psi at 1200 rpm in the larger volume operation.

Circle 50 on postcard for more data

Silicone Rubbers

Dow Corning Corp. has announced the development of seven silicone rubber compounds, including two which represent basic improvements in the field of fuel and solvent resistant elastomers. Considered as a group, the family of materials provides a broad range of applications in the automotive and aircraft as well as other industries.

Silastic 52 and 82 are stocks that can be blended to obtain any intermediate hardness. They are especially formulated for easy handling and processing and good heat stability. Automotive and aircraft applications include gaskets, seals, diaphragms, and tubing.

Silastic LS-63U is a fuel, solvent, and oil-resistant fluorosilicone rubber which is serviceable at both high and low temperatures. Primary uses in aircraft and missiles are for flexible seals and gaskets.

Silastic LS-422 contains a solvent-resistant fluorocarbon silicone rubber polymer compounded with 16 per cent of the reinforcing silica. Ease of handling and pigmentability are among its special benefits.

Silastic 1601 was developed specifically for wire and cable insulation. It requires no mill freshening prior to extrusion.

Silastic 433 Base contains 80 per cent silicone polymer and 20 per cent reinforcing silica. It can be compounded to produce a number of easy handling, heat stable silicone rubber stocks. Its translucent color permits easy pigmenting.

Circle 51 on postcard for more data

Hydraulic Fluid

A new water-in-oil emulsion type hydraulic fluid has been announced by the *Sun Oil Co.*, that possesses a high viscosity rate (130) with good film strength at high temperatures. Called "Sunsafe," the product has fire-resistant properties, good thermal stability even when subjected to operating temperatures of 150 F for prolonged periods, and good anti-wear and antirust characteristics.

It may be used in any hydraulic system where a fire-resistant type fluid is desirable or necessary, at pressures up to 2000 psi and operating temperatures up to 150 F. It may be used with all centrifugal, plain or reciprocating, or piston type hydraulic pumps incorporating plain or friction-type shaft bearings.

Circle 52 on postcard for more data

Aluminum Back-Up Bar

An aluminum back-up bar for metal inert gas-arc welding of aluminum is announced by the *Reynolds Metals Co.*

The bar is made of a machineable aluminum alloy and has an easy replaceable T-shaped stainless steel insert. The aluminum bars are said to dissipate heat quickly, making unnecessary the use of water jackets in use on various production stake welders.

Circle 53 on postcard for more data

Enclosed Gear Drives

Wagner Electric Corp. offers enclosed gear drives to meet application requirements for speed reduction units 125 hp and smaller, with output speeds ranging from 780 to 1.2 rpm at 1750 rpm input speed.

Duti-rated helical gears, heat-treated after cutting by a special

process to obtain maximum hardness, give high capacity, good shock resistance and long wear life. Unit-type housings of corrosion-resistant cast iron have the output shaft endplate and the mounting feet or flange cast as integral parts for strength and rigidity.

Circle 54 on postcard for more data

Liquid Sealer

An iron-like adhesive and sealer has been developed by the *Cycleweld Chemical Products Div. of Chrysler Corp.*

The new product is a putty-like synthetic plastic that sets up into an iron-like substance shortly after it is mixed with a clear liquid hardener. After it has hardened it can be ground, sanded, shaped, filed, or drilled in the same manner as iron.

Circle 55 on postcard for more data

Power Transmission

Manhattan Rubber Div. of Raybestos-Manhattan, Inc. reports the introduction of a new Poly-V belt, the Poly-V "J," to their power transmission products line. It is especially designed for high-speed, small-pulley, power transmission applications.

The drive will operate over sheaves as small as 0.8 in. pitch diameter. Pitch lengths range from 8 to 98 in.

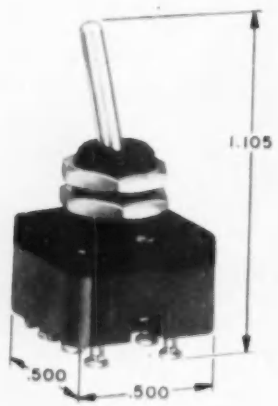
Circle 56 on postcard for more data

Two-Position Switch

A new miniaturized two-position toggle switch designed to save space and weight has been introduced by *Micro Switch, a Div. of Minneapolis-Honeywell Regulator Co.*

The switch (designated 2TM1-T) measures ½ by ½ in. at the base and weighs 4½ grams.

Integral terminals, gold-plated stationary contacts and a high contact



force give the switch a low circuit resistance, and dependable operation is furnished in a temperature range of —65 to 200 F.

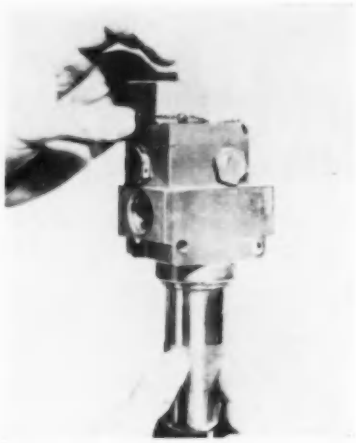
Circle 57 on postcard for more data

Indicator Filters

High or low flow filters with a mechanical indicator to provide a differential pressure signal when cleaning is required have been announced by *Purolator Products, Inc.*

Capable of withstanding full-line pressure (4500 psi) and operable under extreme temperature conditions, the filters can be used for any fluid system in which differential pressure can be used for measurement.

The filters employ a non-magnetic, pressure-sensitive piston which, when actuated by changes in differential



pressure across the filtering element, transmits linear motion to an indicating mechanism which releases a visual button.

Circle 58 on postcard for more data

3000 Lb Capacity Truck

THE Model FTB 30-24 3000 lb capacity lift truck is designed to provide maximum maneuverability. It is suited for use where aisles are narrow and where work space is limited, as for instance, in warehouses, on receiving and shipping docks, and when moving in and out of trucks and freight cars.

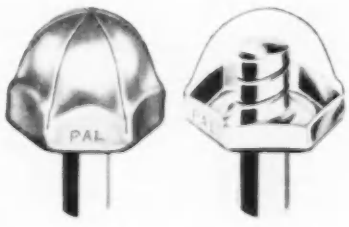
A four cylinder, 133 cu-in. displacement heavy-duty industrial engine, available in either gasoline or LP fuel models, powers the unit. They deliver 35 brake hp at 2400 rpm. *Allis-Chalmers Mfg. Co.*

Circle 59 on postcard for more data

Self-Threading Nuts

Made of spring steel, Acorn Type CST self-threading nuts form their own threads while tightening on unthreaded studs, rod, wire, or rivets of aluminum, zinc, steel, brass or plastic.

The central opening is a double, coarse pitch thread form which acts like a die in starting and forming a continuous spiral thread impression as the nut is turned down in assembly. They are applied with standard assembly tools and may be removed with a wrench and re-used on the same assembly. *The Palnut Co.*



Circle 60 on postcard for more data

Fasteners and Tools

Huckbolt fasteners in ⅝ and ¾ in. nominal pin diameters, together with required installation tooling, are available from the *Huck Mfg. Co.*

Tooling for installing the new fastener sizes include the Model 504 and Model 505 hydraulic installation tools and Model 905 Powerig, a portable hydraulic power unit.

Circle 61 on postcard for more data

Sintered Tungsten

Firth Sterling announces the availability of sintered tungsten and tungsten alloy billets and preformed shapes which are readily forgeable.

Pure tungsten and tungsten alloy such as tungsten-molybdenum and tungsten-tantalum are now available in hollow conical and cylindrical shapes, up to 8 in. in diameter and 4 in. long, as well as in billets 4½ in. diameter and 12 in. long which can be forged into finished pieces. *Firth Sterling, Inc.*

Circle 62 on postcard for more data

Boring Bar Cartridge

The double-quick cartridge (two or more diametrically opposed Sure-Bore cartridges and tool bits, each micrometer adjustable) doubles boring feed without increasing the tool load. The counteraction of the opposed pressures eliminates most of "spring" in bar and insures regularity of bore size regardless of variations in stock removal.

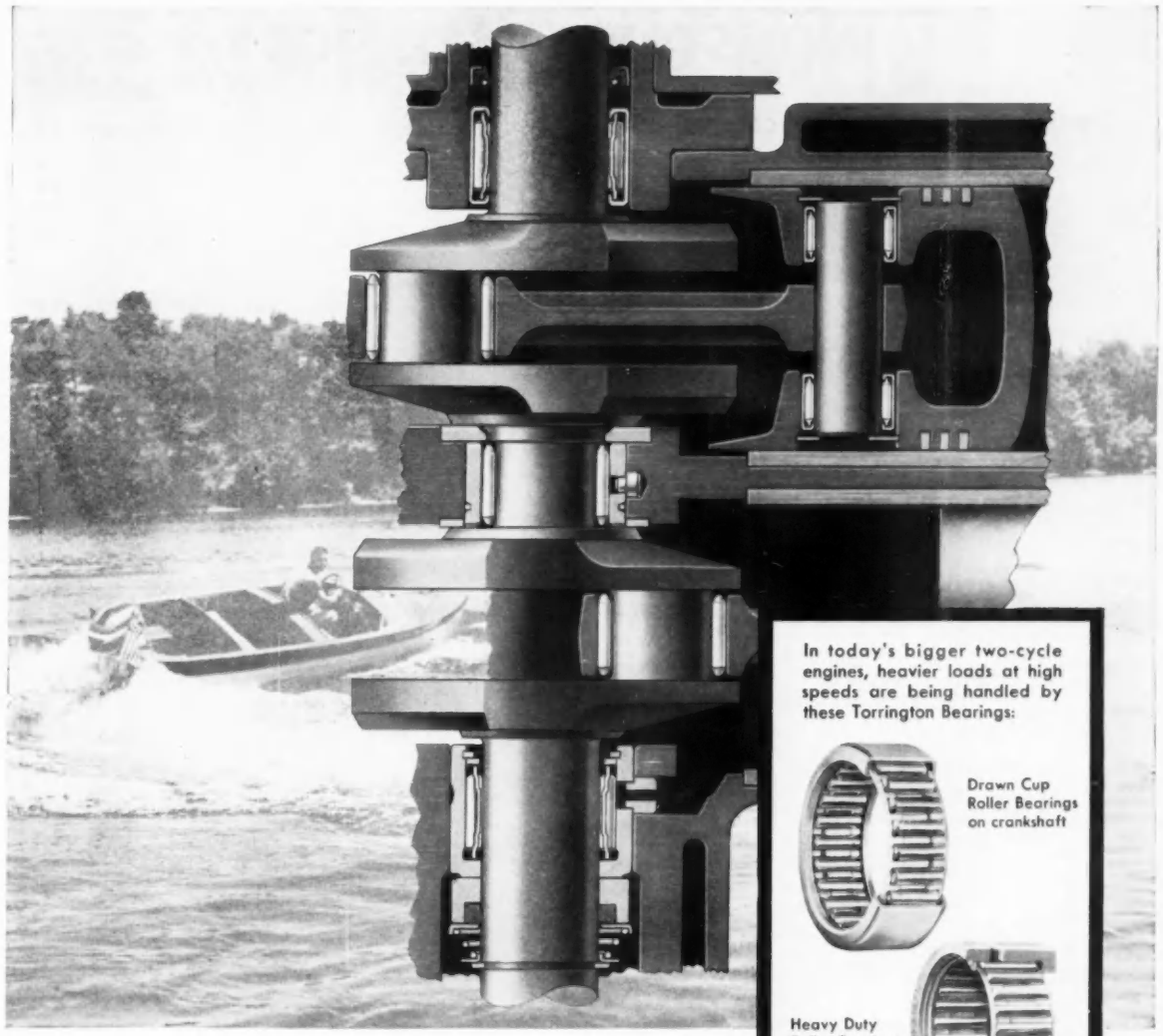
The cartridge is easily adapted to a floating reamer. Run out of the bar, roughness in spindle bearings, reasonable variations in stock removal have no effect on size, roundness, or finish of bore with this floating reamer. *Portage Double-Quick, Inc.*

Circle 63 on postcard for more data

Small Tubing

Small tubing of A-286 austenitic alloy of approximately 55 per cent iron, 25 per cent nickel and 15 per cent chromium, has been successfully cold drawn by *Superior Tube Co.*, and is being offered commercially for high temperature applications. It shows excellent corrosion resistance against all atmospheres encountered in gas turbine service.

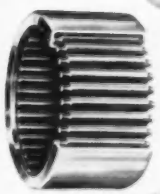
Circle 64 on postcard for more data



In today's bigger two-cycle engines, heavier loads at high speeds are being handled by these Torrington Bearings:

Drawn Cup Roller Bearings on crankshaft

Heavy Duty Roller Bearings



Full Complement Needle Bearings on wrist pins

Needle Rollers with crankpin ends

Fractured outer race for center main on crankshaft

What's new in two-cycle engines?

Today's improved performance and increased power made possible by recent developments in Torrington Bearings!

In this schematic drawing of a typical two-cycle engine, a Torrington Drawn Cup Roller Bearing and a special Torrington Heavy Duty Roller Bearing provide several improvements in the crankshaft mounting. Shaft-riding retainers guide the rollers at the pitch line and provide ample lubricant circulation. Positive roller guidance insures correct bearing performance despite shaft deflection. Split center bearing on crankshaft features a fractured outer race for positive location of the race halves.

Full complement Torrington Needle Bearings and Needle Roller assemblies with crankpin ends complete the compact, high-capacity design to insure long, trouble-free service life. To secure the advantages of modern Needle Bearing design in your application, consult Torrington's engineering department. **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

NEEDLE • TAPERED ROLLER • SPHERICAL ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

• • INDUSTRY STATISTICS • •

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending July 4	Weeks Ending June 27	Year to Date 1959	Year to Date 1958
PASSENGER CAR PRODUCTION				
Total—American Motors	8,024	8,863	221,655	95,313
Chrysler	1,988	1,999	46,025	31,239
De Soto	1,149	1,160	31,749	20,948
Dodge	3,759	3,991	98,928	58,207
Imperial	264	423	11,919	7,771
Plymouth	10,724	11,702	261,464	206,619
Total—Chrysler Corp.	17,894	19,275	450,085	324,784
Edsel	473	556	23,552	6,944
Ford	29,091	31,430	843,592	513,373
Lincoln	346	416	16,099	14,879
Mercury	2,706	3,174	84,182	64,262
Total—Ford Motor Co.	32,616	35,576	967,425	599,458
Buick	2,957	4,245	143,048	133,111
Cadillac	2,711	3,402	90,798	77,051
Chevrolet	26,680	35,550	901,790	718,804
Oldsmobile	5,087	8,617	227,993	179,386
Pontiac	7,797	11,006	251,659	120,185
Total—General Motors Corp.	47,232	62,820	1,615,486	1,228,537
Total—Studebaker-Packard Corp.	2,581	2,621	90,340	20,896
Checker Cab	.....	.....	2,839	1,964
Total—Passenger Cars	108,347	129,155	3,347,832	2,270,952
TRUCK AND BUS PRODUCTION				
Chevrolet	8,117	8,693	219,275	149,776
G. M. C.	1,613	2,410	48,454	32,434
Diamond T	94	127	3,402	2,879
Divco	64	80	1,972	1,488
Dodge and Fargo	1,630	1,591	44,289	31,125
Ford	6,446	7,312	182,994	117,215
F. W. D.	20	21	517	734
International	3,419	3,311	79,188	49,801
Mack	333	301	8,874	7,768
Studebaker	252	305	7,278	5,811
White	112	430	10,175	9,068
Willys	1,855	2,241	62,030	42,286
Other Trucks	70	80	1,978	1,620
Total—Trucks	24,025	27,002	670,426	452,005
Buses	25	30	1,525	1,675
Total—Motor Vehicles	132,397	156,187	4,019,783	2,724,632

1959 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	April	Four Months 1959	Four Months 1958
Vans			
Insulated and refrigerated	406	1,553	1,076
Steel	60	208	153
Aluminum	346	1,345	923
Semi-insulated	65	236	167
Steel	65	236	167
Aluminum			
Furniture	163	513	575
Steel	126	406	575
Aluminum	37	107	
All other closed top	2,457	8,825	4,787
Steel	703	2,567	1,737
Aluminum	1,754	6,258	3,050
Open-top	232	771	548
Steel	70	274	290
Aluminum	162	497	258
Total—Vans	3,323	11,898	7,153
Tanks			
Non- and low pressure			
Petroleum			
Carbon and alloy steel	243	859	809
Stainless steel	32	93	90
Aluminum	151	544	422
Total—Petroleum	426	1,496	1,321
Chemical, food, fluid solids	44	143	267
All other, incl. aircraft refuelers	233	530	158
High Pressure (LPG, chemicals, etc.)	18	124	114
Total—Tanks	721	2,293	1,860
Pole, pipe and logging			
Single axle	43	115	103
Tandem axle	108	283	159
Total	151	398	262
Platforms			
Racks, livestock and stake	39	160	593
Grain bodies, all types	182	582	267
Platforms (flats), all types	821	3,126	1,583
Total—Platform	1,042	3,868	2,443
Low-bed heavy haulers	280	892	744
Dump trailers	311	894	666
All other trailers	308	1,039	555
Total—Complete Trailers	6,136	21,282	13,683
Trailer chassis[1]	389	1,712	1,035
Total—Trailers and Chassis	6,525	22,994	14,718

[1] Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS

Zone	Region	April 1959	March 1959	April 1958	Four Months 1959	Four Months 1958	Per Cent Change Apr. over March	Apr. over Apr. 1958	Four Months 1959 over 1958
1	New England	33,072	25,429	27,587	91,148	80,582	+30.06	+19.88	+13.11
2	Middle Atlantic	105,812	93,025	84,946	342,282	289,337	+13.75	+24.56	+18.30
3	South Atlantic	68,816	66,650	46,253	255,118	194,911	+ 3.25	+48.78	+30.89
4	East North Central	153,412	124,219	102,299	480,110	361,630	+23.50	+49.96	+32.76
5	East South Central	24,788	24,836	17,055	89,361	70,476	− .19	+45.34	+26.80
6	West North Central	60,555	39,186	44,915	176,246	149,053	+54.53	+34.82	+18.24
7	West South Central	40,039	42,442	32,544	163,891	147,274	− 5.66	+23.03	+11.28
8	Mountain	19,183	17,429	14,970	69,882	57,199	+10.06	+28.14	+22.17
9	Pacific	68,100	63,501	48,029	245,760	184,957	+ 7.24	+41.79	+32.87
	Total—United States	573,777	498,717	418,598	1,913,798	1,535,419	+15.51	+37.07	+24.64

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., Ore., Wash.

1959 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	33,000 lb. and over	Total
Total—First Quarter	159,906	46,596	3,915	25,857	35,133	15,806	10,358	9,801	307,372
April	57,486	19,408	1,520	10,413	14,368	5,700	4,062	3,953	116,910
May	58,271	17,377	1,433	9,943	15,105	5,592	3,550	3,724	114,995
Total—Five Months—1959	275,663	83,381	6,868	46,213	64,606	27,098	17,970	17,478	539,277
Total—Five Months—1958	182,132	54,873	5,930	38,133	43,445	23,573	13,500	12,063	373,649

BETTER SUSPENSION...

...for that NEW BABY of yours!

Your next model, now in the planning stages, will be by far the best you've ever built. Naturally, you'll do *everything* to surpass the best you've ever produced before.

But how about suspension? New advances in the design and engineering of *steel springs* can accomplish what seemed impossible a year or two ago. Better metals. Controlled tempering. Scientific methods. For load balance, controlled sidesway and rebound, positive alignment and structural strength, TODAY'S springs by BURTON can work wonders.

Consult our engineering staff . . . *early!*

"Vital Support to the Automotive Industry"

BURTON SPRINGS

FOR MOTOR CARS • TRUCKS • BUSES • TRACTORS • TRAILERS • OFF HIGHWAY EQUIPMENT

BURTON AUTO SPRING CORPORATION . . . WESTERN AVENUE AT 48th STREET

CHICAGO 32, ILLINOIS

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

Machine Tool Sales in May Totaled $48.1 Million Versus April's $53.2 Million. However, Net New Orders Booked First Five Months Up 62 Per Cent Above Last Year's

Machine Sales in May Maintained Up-Trend

May machine tool sales were off from April bookings, but still maintained the 1959 monthly average of close to $48 million—up considerably from last year's results.

In May, metal-cutting and metal-forming net new orders amounted to, respectively, $37.1 million and $11.0 million, for a total of $48.1 million. This represented a drop of less than 10 per cent from April's total of $53.2 million. On the other hand, it was up 71 per cent over May, 1958's $28.05 million.

For the first five months of this year, net new orders for both types of machine tools amounted to $239.3 million—up 62 per cent over the $147.65 million booked during the same period of 1958.

Shipments of machine tools in May, 1959—as also reported by the National Machine Tool Builders' Association—were $41.25 million in dollar volume. In April of this year they totaled $45.0 million; while in May, 1958 the total was $50.1 million.

Centerless-Grinding Field Entered by Norton Co.

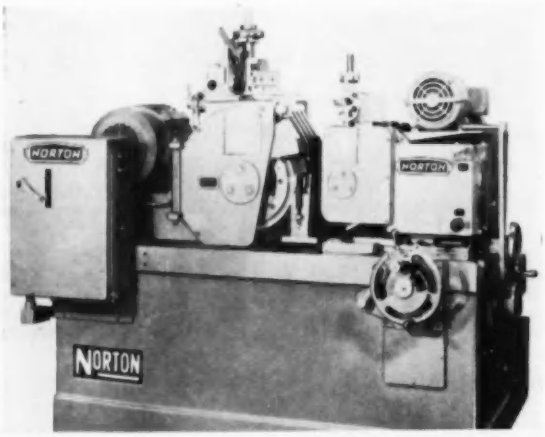
After many years (since 1900) of making work-held-on-centers cylindrical grinders, as well as surface and special-purpose grinding machines, Norton Company's Grinding Machine Div. has now, for the first time, entered the centerless-grinding-machine field.

The unveiling of the company's new entry—called the Norton No. 2 Straddle - Bearing Centerless Grinder—took place at a press conference held late last month in Worcester, Mass. It is so new that only two prototypes have been built and apparently none sold to date—although it is understood a production lot of 12 is now in process.

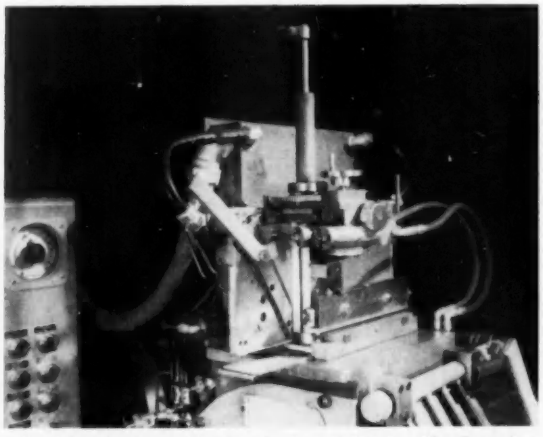
One of the principal features of the machine is the introduction of anti-friction ball bearings on both ends of the grinding wheel spindle, plus a plain center bearing. The outboard spindle bearing is mounted in a support which is bolted to the hinged wheel-guard cover, in turn bolted to the main wheel guard structure. The regulating wheel similarly straddles double-row ball bearings. These spindle supporting means have, of course, been provided to give added support on both sides of the wheels and thus minimize deflection when using wide wheels and heavy grinding pressures. In practice, size and straightness control are said to be more consistent—even though, on through-feed grinding, the loading may be interrupted.

Another feature of the machine is the method employed for grinding wheel truing. The operation is manually-controlled but hydraulically-powered. After feeding the truing diamond manually, the operator throws a lever which actuates the hydraulic truing stroke. This device also permits the truing

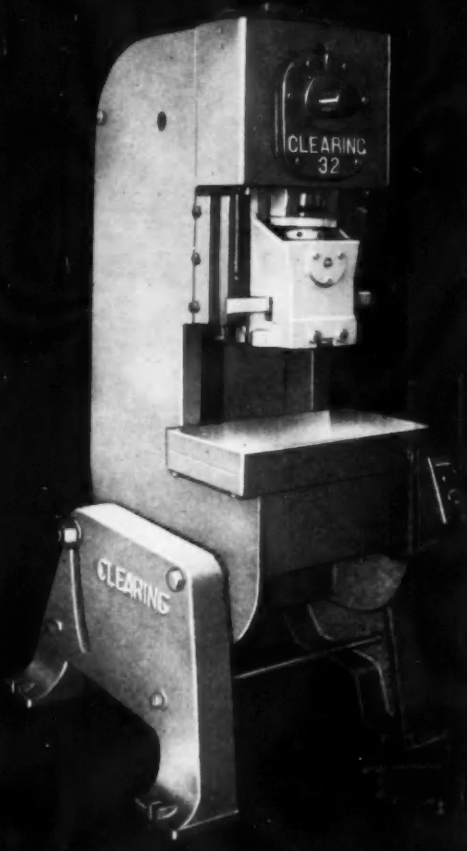
(*Turn to page* 116, *please*)



Norton No. 2 Straddle-Bearing Centerless Grinding Machine which features anti-friction bearings on both ends of the grinding wheel spindle



Wheel-head-mounted truing device on Norton No. 2 centerless grinder permits the truing of a 90-deg step in the grinding wheel



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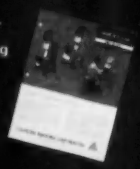

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AIR BRIEFS

By David A. Partridge

AIA Forms Guided Missile Council

Orval R. Cook, president of the Aerospace Industries Association, announced that the Guided Missile Committee, formerly a division of the Association's Technical Service, will be reorganized to function within the AIA as the Guided Missile Council.

The purpose of the change, said Mr. Cook, is to allow the new council to enlarge its scope of activity more in keeping with the rapidly expanding progress of the aviation industry. Previously, this division operated as a function of the AIA Technical Service and concerned itself mainly with the engineering aspects of missile research and manufacture. In elevating the committee to council status, its operations will encompass all types of management interests relating to guided missile manufacture, in addition to engineering.

Airline Safety Shows Notable Improvement

Despite the increase of traffic and aircraft speeds and complexity, aircraft safety records have shown a marked improvement in recent years, according to the Cornell-Gugenheim Aviation Safety Center, in its ninth annual Survey of Research Projects in Aviation Safety.

The survey states that U. S. domestic and international carriers hauled over 48 million passengers and flew more than 32.1 billion passenger miles, with a loss of 124 lives in six fatal accidents. This represents a rate of 1 fatality per half million passengers; one fatality per 163 million miles flown; or 0.40 per 100 million passenger miles.

The overseas component of these airlines operated in 1958 with only 10 fatalities, the survey shows, and the rate was placed at 0.2 per 100 million passenger miles.

Non-scheduled air transport had no fatalities in 1958.

In view of the high performance military aircraft now in the Nation's armory the military also scored a rather remarkable record last year. This record can be attributed to the vigorous flying safety programs carried out by the various services.

In 1957, latest year for which full figures are available, the 65,000 airplanes in the general aviation fleet had 4189 accidents, resulting in 800 deaths. However, "the business flying portion of this activity was conducted at a rate much better than this total," says the survey, "and one which is constantly improving."

Shipments of Utility and Executive Aircraft

Shipments during April of 701 one-to-ten place utility and executive aircraft valued at $11,960,000 manufacturer's net billing price, were announced by Joseph T. Geuting, Jr., Manager of the Utility Airplane Council, Aerospace Industries Association. During the same month of last year 655 units valued at $10,399,000, were shipped.

Renegotiation Continued

Congress has decided that renegotiation of defense contracts will continue at least another two years.

The renegotiation law was to have expired on June 30 but the act, which gives the Government the authority to review and adjust contract profits, will remain in effect until June 30, 1962.

Industry Employment Continues Decline

Employment in the aircraft and parts industry continued a slight decline in March below the January '59 reporting level after showing a modest gain in February, according to the Bureau of Labor Statistics. Actually, employment reached 756,800 in January, climbed to 757,200 in February, then decreased to 753,500 in March '59. Employment by the end of the year is estimated to stabilize at approximately 755,000 workers.

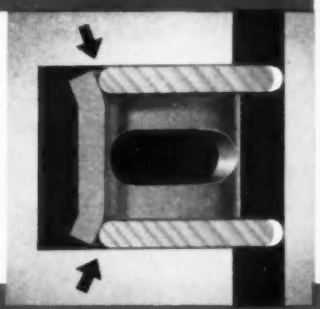
Aircraft Hourly Earnings Up

Average hourly earnings in the aircraft, engine, propeller and parts industry climbed to $2.58 in March. This represents a seven-cent per hour gain over hourly wages reported during 1958, but a loss of one cent under the average rate reported in February 1959. ■

Electroplaters Elect

American Electroplaters' Society elected Ralph D. Wysong of Studebaker-Packard Corp. for the coming year. Wysong, manager of manufacturing research at S-P, succeeds another automobile man, Herberth E. Head of Chrysler Corp. The AES elected Wysong at its 50th anniversary convention in Detroit last month, held in conjunction with the Industrial Finishing Exposition, International Conference on Electrodeposition and Metal Finishing, and meeting of the National Association of Metal Finishers.

Exclusive Design of Sealed Power STAINLESS STEEL OIL RINGS does stop smoking in high compression engines



Sealed Power 3-piece stainless steel oil rings stop smoking and here's why:

The enlargement below shows a cross-section of the stainless steel oil ring in the piston groove. Note the unique angle of the shoulders (arrows). This angle produces the side pressure which holds the rails snugly against the sides of the groove. Thus oil cannot pass around the back of the ring—no smoking, even under high vacuum operation.

The exclusive design of the Sealed Power stainless steel expander spacer assures full support to the chrome-faced rails. No flutter, no instability.

Stainless steel (a new material) retains its original, built-in tension for the life of the ring. Therefore this new design principle works at full efficiency during entire ring life.

OTHER KEY FEATURES:

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SAE Summer Meeting

(*Continued from page 68*)

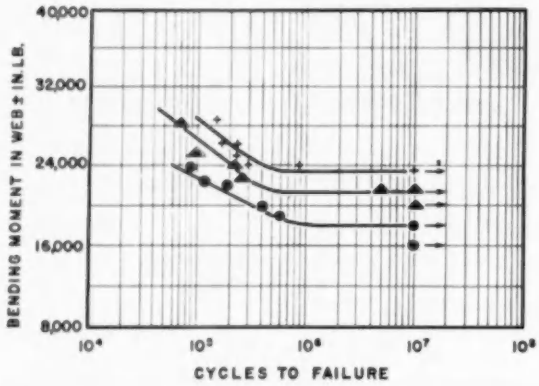

Fig. 1—Results of bending fatigue tests

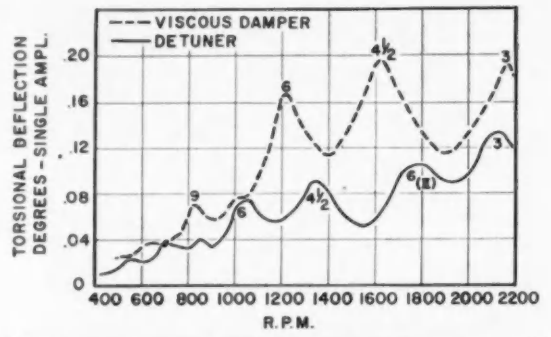

Fig. 2—Viscous damper versus detuner

It should be pointed out that the old arrangement with its .20 deg. single amplitude was entirely satisfactory. Nevertheless, the amplitude reduction of some 50 per cent is certainly worthwhile.

An incidental benefit, as yet not proven by endurance tests, but which can reasonably be expected, is increased belt life. In the old arrangement, the belts were driven by pulleys keyed to the crankshaft, so that they participated in crankshaft vibrations. Now, however, the belt grooves are incorporated in the inertia mass, which runs at substantially constant angular velocity.

SAE 1046 is used for this forging. It is heat treated to 248/277 Brinell and all bearing surfaces are induction hardened to Rockwell "C" 48/52. Rolling the fillets and changing the location of the oil supply hole in the crankpin has increased the fatigue strength of the shaft beyond the values shown in the graph.

Surface Ignition—A New Look With a New Instrument

By K. Hyatt, V. J. Tomsic and C. A. Mellinger

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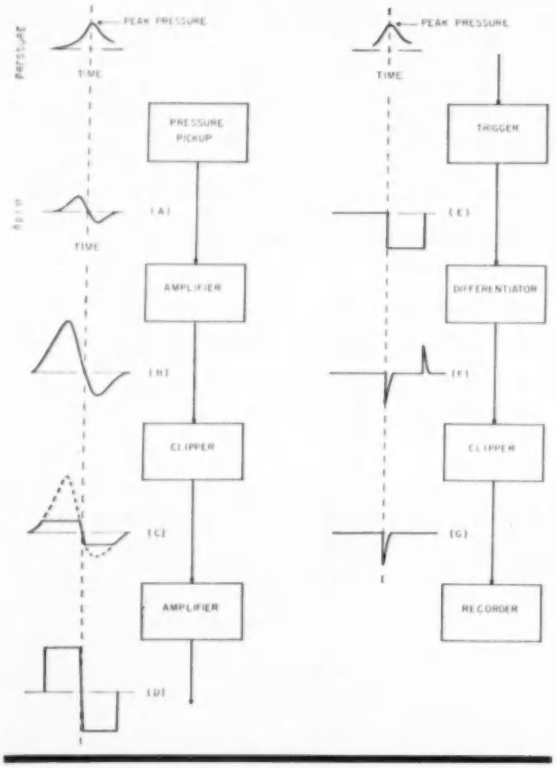


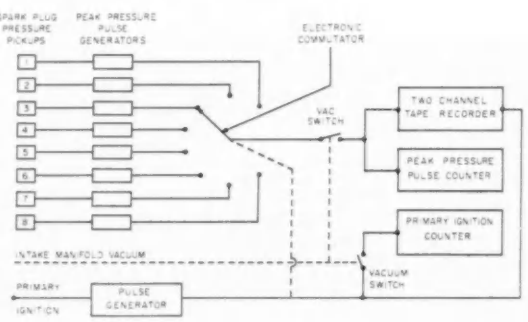
Fig. 1 — Simplified block diagram of peak pressure pulse generator for single-channel data accumulation

Fig. 2 — Simplified block diagram for eight-cylinder data accumulation

To obtain the data required to assess the prevalence of surface ignition in late model cars, a unique electronic instrument has been developed by the Du Pont Petroleum Laboratory. This instrument, requiring no mechanical modifications to the engine for its use, is accurate, reliable and generally more sensitive than ionization gaps.

The occurrence of surface ignition

(*Turn to page 96, please*)



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(*Continued from page* 94)

results in a decrease in the time required for the development of peak cylinder pressure. The instrument to be described measures very accurately the time in crankangle degrees between spark ignition and peak pressure for each combustion cycle during the wide-open-throttle acceleration of a multicylinder engine. The instrument can be used equally well, of course, in single cylinder engine studies.

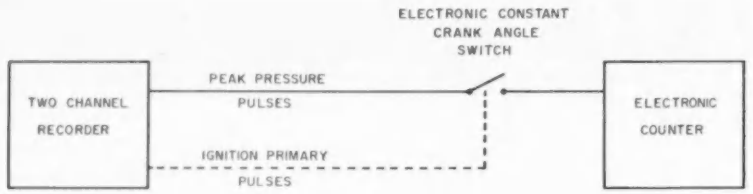

Fig. 3—Simplified block diagram of data reduction system

Cylinder pressures are measured by miniature SLM PZ-6 piezoelectric pressure transducers integrally mounted in standard spark plugs.

The technique employed for measuring the change in peak pressure occurrence time due to surface ignition can be divided into two phases. The first is the accumulation of data on magnetic tape, and the second is the reduction of these data to a usable form.

Data Accumulation

The basic electronic components for accumulating peak pressure occurrence data from a single cylinder are shown in Fig. 1. Cylinder pressure development is sensed by the pickup through a connecting passage drilled through the body of the spark plug. In all cases, the spark plug normally recommended for the engine under test is modified to receive the pressure pickup. For convenience, a signal of the rate-of-pressure change with respect to time, dp/dt, is utilized rather than a pressure-time signal. Components (B) through (E), representing the various stages of a peak pressure pulse generator, produce an electrical pulse coincident with peak pressure. The dp/dt signal (A) is amplified (B) and then symmetrically clipped (C). The clipped dp/dt wave form (C) is further amplified (D), and a pulse (E) is triggered at the zero crossing point. The squared electrical pulse (E), the leading edge of which is coincident with peak pressure occurrence, is differentiated (F), and the positive pulse is removed by a diode clipper. The negative pulse (G), which is coincident with the time of peak pressure occurrence, is then recorded on one channel of a magnetic tape recorder.

Separate pickups and peak pressure pulse generators are used for each individual cylinder in multicylinder engines, as shown in Fig. 2. Signals from the eight channels are combined into a single channel for recording. This is accomplished with an electronic commutator indexed to the proper input channel by the primary ignition pulse from the cylinder in which combustion is taking place. A

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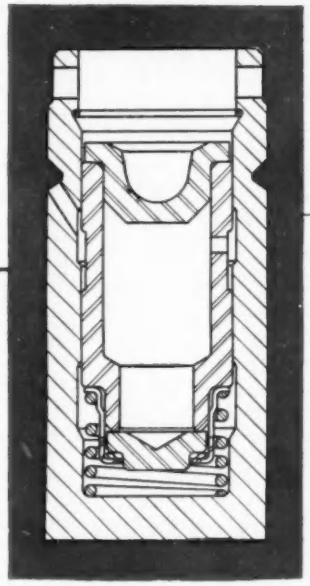

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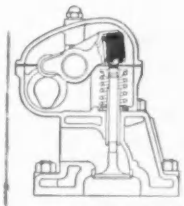
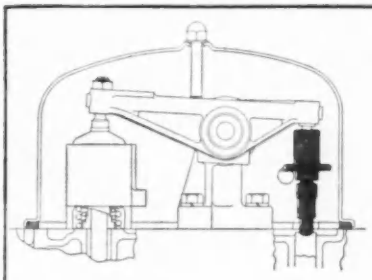
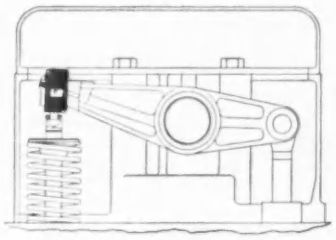


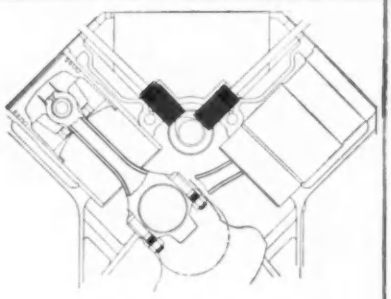
INSERT TYPE ROCKER ARM UNIT



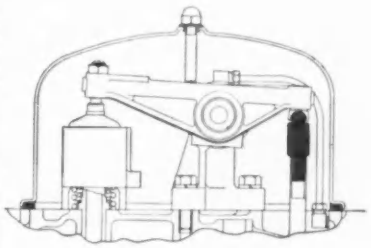
PUSH ROD TYPE FOR COMPRESSION RELEASE APPLICATION



THREADED TYPE ROCKER ARM UNIT



V-8 AUTOMOTIVE HYDRAULIC TAPPET APPLICATION



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means is provided for keeping the commutator synchronized with engine operation.

Another pulse generator produces a pulse coincident with the opening of the distributor points and thus coincident with spark timing. This pulse is recorded on a second channel of the magnetic tape recorder. A vacuum switch in series with the electronic commutator and recorder permits recording of peak pressure pulses only during maximum throttle operation of the test vehicle, i.e., 4 in. Hg manifold vacuum or less.

Two electronic counters monitor the instrumentation during data accumulation. The total number of peak pressure pulses and the total number of primary ignition pulses are registered on the counters during maximum throttle operation. Agreement of the totals indicates that the various stages of the instrumentation used for data accumulation are operating properly. Although not developed for such purposes, the instrument is also a very sensitive misfire detector, since misfire cycles will show up as peak pressure pulses at top-dead-center and can be counted separately.

Data Reduction

The basic electronic components for converting the peak pressure occurrences from the two-channel magnetic tape recorder to usable data are shown in Fig. 3. The primary ignition pulses recorded on the magnetic tape actuate an electronic constant-crankangle switch. The switch is closed by the primary ignition pulse and remains closed for a preset number of crankangle degrees. The negative pulses (coincident with peak pressure) that occurred in this crankangle interval are registered on the electronic counter. The total count registered at a given crankangle setting is the number of cycles giving peak pressure between ignition and the given setting. The magnetic tape is passed through the read-out section of the instrument several times at different crankangle settings to give a complete picture of the distribution of peak pressure times. The instrument in its original configuration, as described here, combined the peak pressure pulses from all cylinders of a multicylinder engine, so that a large peak pressure advance due to surface ignition in one cylinder was averaged with the peak pressure times of normal combustion in the other cylinders. A subsequent revision of the instrumentation to increase its usefulness allows peak pressure time distribu-

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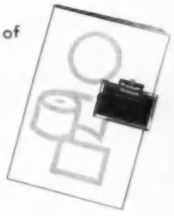

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tions to be obtained for each cylinder of a multicylinder engine. The revision involved the addition of eight counters to the read-out section of the instrument.

The combined variability of the instrument, apart from any engine and pressure pickup variabilities, is less than plus or minus one-tenth of a crankangle degree or about five millionths of a second at 3200 engine rpm.

New Elastomers Break Old Barriers

By Ralph P. Schmuckal
FORD MOTOR CO.

It is clear that elastomers are available today to solve most of the current technical problems of rubber in the automotive industry.

The cost of many, however, seems prohibitive. The result is that they are used only as a last resort—usually to solve an otherwise insoluble or extremely serious problem. Volume use of the premium-priced polymers will reduce the price, but such materials as the fluorinated elastomers, because of the basic materials and processes involved, always will be expensive in comparison with the more conventional, widely used, elastomers.

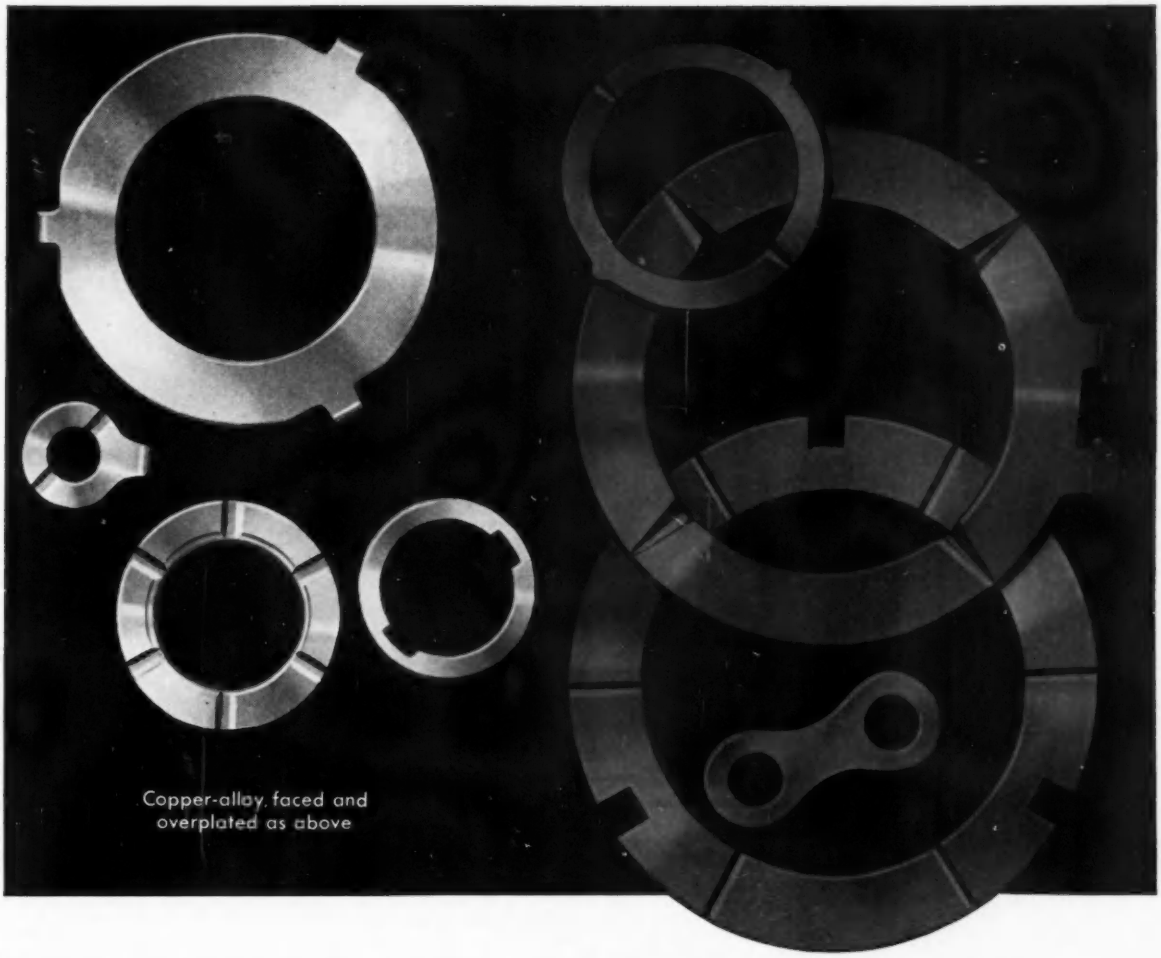
But certainly there is a place for premium-priced elastomers in the automotive industry. Seals of polyacrylates, silicones, or fluorinated hydrocarbons may permit higher temperature operation of automatic transmissions and eventually may eliminate the expensive oil cooler on many transmissions.

Mechanical rubber goods may take advantage of the extreme toughness, strength, and abrasion resistance of urethane rubber and, by letting a small volume of rubber do the work of a relatively large volume of conventional elastomer, possibly actually reduce cost and save space as a bonus feature.

The automotive industry has not yet taken full advantage of all the superior and peculiar properties of the new elastomers. To accomplish this, components must be designed around the material in contrast to the more normal procedure of fitting a material to an established design. A sound approach in many instances would be to break with precedent and obsolete the design, apply imagination, and use the elastomer properly. The results may be astounding.

AMA Safety Grants

The Automobile Manufacturers Association has tabbed $1,773,000 for grants during the current fiscal year to 12 organizations for research and promotion of highway safety. This, according to AMA president L. L. Colbert, tops last year's total by more than $250,000. Cornell University's crash injury research program, Automotive Safety Foundation, National Safety Council and the Northwestern University Transportation Center are the leading beneficiaries of the increased aid.



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These motors are series wound, but shunt and compound wound motors can be supplied if required. Traction motors are reversible. Pump motors rotate clockwise facing drive end, but can be made counterclockwise if desired. For details clip the coupon opposite.

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SHORTIES

Taxes represent almost one-fourth the price a consumer pays for the average low-priced car.

•

Consumption of gasoline in the U. S. hit a record peak in 1958 of 59 billion 154 million gallons. This is a gain of 1¾ billion gallons over the previous high of 57 billion 415 million gallons in 1957.

•

It is estimated that taxes levied on gasoline by Federal, state, and local governments totaled 4-⅔ billion dollars in 1958. This is equivalent to slightly more than 42 per cent of the retail price.

California — still the biggest state consumer, by far — accounted for 5 billion 743 million gallons in 1958, up almost 300 million gallons over 1957.

•

In three months—July, August, and October — Californians consumed more than 500 million gallons per month — more than 16 other states used up in the entire year.

•

Texas continues as the second biggest state consumer of gasoline, with 4 billion 705 million gallons in 1958. New York was third with slightly better than 4 billion gallons, Pennsylvania fourth, and Ohio fifth.

•

In all, 22 states now use a billion or more gallons of gasoline a year, an increase of two states (Oklahoma and Washington) over last year.

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are:

AUSTIN-WESTERN WORKS, BALDWIN-LIMA-HAMILTON CORP., Aurora, Ill.
Industrial hydraulic shop crane, 1 ea—$23,563

passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period June 1 to June 30, inclusive.

BAKER INDUSTRIAL TRUCKS, DIV. OF OTIS ELEVATOR CO., Cleveland Ohio
Tractor, aircraft, towing—107 ea—$329,741

BENDIX AVIATION CORP., PRODUCTS DIV., South Bend, Ind.
Brake assy—$75,862

CHESAPEAKE MACHINERY CO., Pasadena, Md.
Lathes, 6 ea—$74,070

CHRYSLER MOTORS CORP., Washington, D. C.
Sedans and station wagons, 138 ea—$234,261

CHRYSLER CORP., Detroit, Mich.
Tank, combat, full tracked—$2,874,764

CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Spare parts, aircraft—$69,043

DOUGLAS AIRCRAFT CO., INC., Charlotte, N. C.
NIKE spare parts & components—$202,235

ELECTRIC AUTO-LITE CO., Toledo, Ohio
Battery, 78,600 ea—$1,333,842

FEDERAL AIRCRAFT WORKS, INC., Mineapolis, Minn.
Spare parts, aircraft—$33,467

FIRESTONE TIRE & RUBBER CO., Los Angeles, Calif.
Guided missile—$900,000

FORD MOTOR CO., FORD DIV., Washington, D. C.
Trucks, 33 ea—$91,044

FORD MOTOR CO. OF CANADA LTD., OVERSEAS DIV., East Toronto, Ontario, Canada
Sedans, 4 ea—$10,061

FOREIGN DIST. DIV., New York, N. Y.
Trucks, 6 ea—$10,392

GENERAL ELECTRIC CO., FLIGHT PROPULSION DIV., Cincinnati, Ohio
Turbojet aircraft engines, 66 ea—$5,979,629

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Automobiles, 25 ea—$39,501

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Trucks, 167 ea—$284,130

GENERAL MOTORS CORP., FOREIGN DISTRIBUTORS DIV., New York, N. Y.
Sedans, station wagons, trucks, 99 ea—$210,769

GENERAL TIRE & RUBBER CO., Akron, Ohio
Wheel assys, nose, 1,874 ea—$74,154

GISHOLT MACHINE CO., Madison, Wis.
Lathe, turret, 1 ea—$46,542

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Dayton, Ohio
Wheel & brake assys, aircraft—$247,640

B. F. GOODRICH TIRE CO., DIV. B. F. GOODRICH CO., Akron, Ohio
Tire, 22,500 ea—$657,225

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Spare parts, aircraft—$129,667

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Tire, 2,400 ea—$90,648

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel, landing gear—$107,809

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel assys, 1,023 ea—$381,820

HEALD MACHINE CO., Worcester, Mass.
Grinder machine, 1 ea—$31,706

HIGH SPEED HAMMER CO., INC., Rochester, N. Y.
Drilling machine—$25,874

HOOVER ELECTRIC CO., Los Angeles, Calif.
Spare parts, aircraft—$311,227

OFFICES HENRY C. HOWELLS, Washington, D. C.
Grinding machine, 1 ea—$79,019

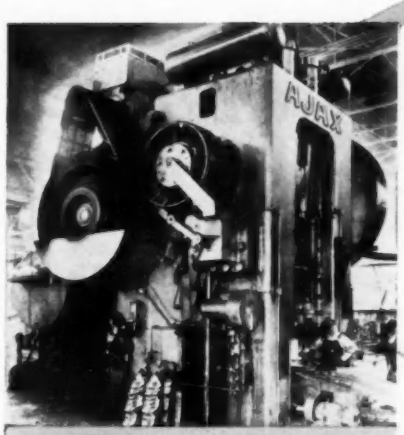
HYDRO-AIRE, INC., Burbank, Calif.
Spare parts, aircraft—$41,564

INTERNATIONAL EQUIPMENT CORP., Washington, D. C.
Power shovels, 3 ea—$32,641

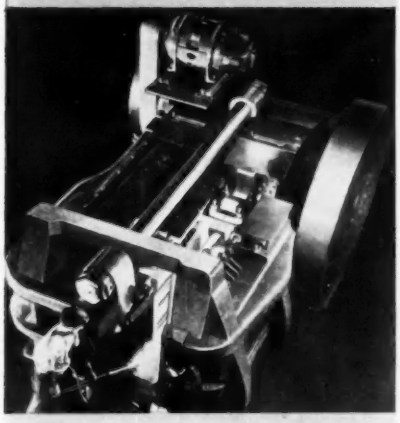
(*Turn to page* 106, *please*)

AJAX
FORGING MACHINERY

Engineered to forge more accurate parts with less machining



AJAX "HIGH SPEED" FORGING PRESSES



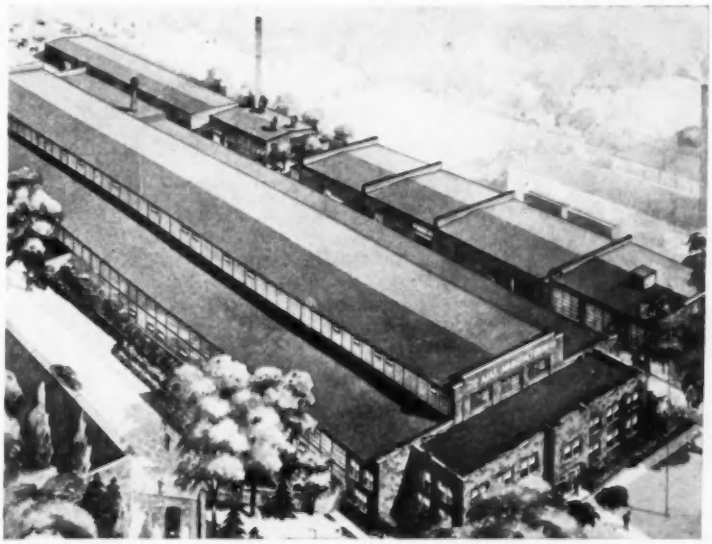
AJAX "AIR CLUTCH" FORGING MACHINES

AJAX "WIDE ADJUSTMENT" FORGING ROLLS

AJAX MACHINES are built with exceptionally rigid bed frames to assure excellent alignment and accurate die match.

SOLID STEEL FRAMES provide the maximum rigidity necessary for the production of uniform and accurate forged parts.

For a greater saving in material and machining costs . . . Specify AJAX Forging Machinery.



THE MODERN AJAX PLANT FACILITY EQUIPPED WITH THE LATEST IN MACHINE TOOLS TO BUILD THE BEST IN FORGING MACHINERY

THE **Ajax** MANUFACTURING COMPANY
1441 CHARDON RD. CLEVELAND 17, OHIO
CHICAGO OFFICE: 110 S. DEARBORN ST., CHICAGO 3, ILLINOIS
WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

Circle 152 on Inquiry Card, for more data

(*Continued from page* 104)

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks, 7 ea—$21,484

INTERNATIONAL HARVESTER CO., Washington, D. C.
Truck-tractor, 1 ea—$11,909

INTERNATIONAL HARVESTER CO., Chicago, Ill.
Trucks, 23 ea—$125,396

KELSEY-HAYES CO., Detroit, Mich.
Wheel assy, 13,765 ea—$48,039

KURT ORBAN CO., INC., AMERICAN TREBEL DIV., Greenwich, Conn.
Balancing machine, 10 ea—$86,105

LAHER SPRINGS TIRE CORP., Oakland, Calif.
Motor scooters, 8 ea—$13,397

LAHER SPRING & TIRE CORP., Oakland, Calif.
Spring, rear assy, 5,916 ea—$102,465

MACHINERY ASSOCIATES, INC., Wynewood, Pa.
Boring, drilling and milling machine, 2 ea—$103,088

McCAULEY INDUSTRIAL CORP., AIRCRAFT DIV., Dayton, Ohio
Propeller assys, 277 ea—$37,650

McCREARY TIRE & RUBBER CO., Indiana, Pa.
Tire, 2,000 ea—$94,940

McDONNELL AIRCRAFT CORP., St. Louis, Mo.
Spare parts, aircraft—$815,087

MEMPHIS COACH CO., INC., Memphis, Tenn.
Automobile, ambulance, 38 ea—$188,825

MOHAWK RUBBER CO., Akron, Ohio
Tire, 12,774 ea—$606,381

MOORE SPECIAL TOOL CO., INC., Bridgeport, Conn.
Boring machine with related equipment —$35,780

NORTHROP CORP., NORAIR DIV., Hawthorne, Calif.
Spare parts, aircraft—$27,115

RYAN AERONAUTICAL CO., San Diego, Calif.
Target missile—$25,686

SEREN MACHINE PRODUCTS CORP., Schiller Park, Ill.
Fifth wheel assy, 1,575 ea—$281,925

SOUTHERN EQUIPMENT SALES, INC., Jackson, Miss.
2 cranes—$43,183

STANDARD MANUFACTURING CO., INC., Dallas, Tex.
Truck lift for aerial stores, 307 ea—$1,804,943

THREADWELL CONSTRUCTION CO., Midland, Pa.
Chassis, trailer, 1,119 ea—$1,062,535

TROYLER CORP., Scranton, Pa.
Trailer, cargo, 1,470 ea—$1,317,845

UNITED AIRCRAFT CORP., HAMILTON STANDARD DIV., Windsor Locks, Conn.
Spare propellers—$2,196,613

UNITED CONTROL CORP., Seattle, Wash.
Spare parts, aircraft engines—$165,006

UNITED STATES RUBBER CO., FISK TIRES DIV., Detroit, Mich.
Tire, 57,945 ea—$1,728,074

GEORGE E. VIERECK & CO., INC., Washington, D. C.
Lathe, engine, 3 ea—$48,997

WARD LA FRANCE TRUCK CORP., Elmira Heights, N. Y.
Tractor, wheeled, industrial—$2,937,299

WAUKESHA MOTOR CO., Waukesha, Wis.
Automotive repair parts, indefinite quantity—$150,000

WEST BEND ALUMINUM CO., West Bend, Wis.
Launcher, rocket, 3,740 ea—$1,195,386

WESTERN ELECTRIC CO., INC., New York, N. Y.
NIKE spare parts and components—$1,875,347

WILLYS MOTORS, INC., Toledo, Ohio
Trucks and spart parts, 26 ea—$61,515

YALE & TOWNE MFG. CO., MATERIALS HANDLING DIV., Philadelphia, Pa.
Truck, side loading, 7 ea—$78,579

When They Compare for

Clutch Torque Retention

...Fleet Operators Switch to LIPE!

Torque retention is an important matter to the steadily growing body of fleet owners who are changing over to Lipe. Their every-day experience tells them that Lipe Heavy-Duty Clutches mean *more* miles per gallon of fuel . . . *more* ton-miles between shop-stops . . . *more* capital-equipment-use per repair dollar. All because of Lipe's high retention of torque capacity. Why argue with these practical men? Give them what they want: Lipe Heavy-Duty Clutches, either as original or optional equipment. Let their growing numbers prove to you that *the trend is to* LIPE!

Lipe Heavy-Duty DPB Clutches are available in single and two-plate types; 12", 13", 14" and 15" sizes; with torque capacities from 300 to 1900 ft.-lbs.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.

Circle 154 on Inquiry Card, for more data

Resurgence of business health in other countries is definitely hurting U. S. foreign sales, the Eisenhower Administration admits. Foreign manufacturers are producing and exporting goods in increasing volume.

But Washington insists that foreign markets can still be rich markets for U. S. manufacturers if new production opportunities are searched out. True, foreign labor costs are usually low enough to permit lower prices. But introduction of new products, new methods, and greater efficiency in old methods can spell rewards for enterprising firms, the Government says.

Here's what's happening: U. S. exports this year are running well below 1958 shipments. Exports have been decreasing since 1957, when they hit a high of $20.8 billion. In 1957, the value fell to $17.8 billion. It appears that this year's total will be 4 or 5 per cent below the 1957 figure. Imports, meanwhile, are on the increase.

Here's the inside word on the upcoming (1961) federal budget: Higher, by a sharp $3 billion-plus. This may well be the largest budget in U. S. history.

The Administration has frankly given up on trying to boil the fat (nondefense projects) out of the budget. White House money men say their frustration is due to the tendency of the Democratic-controlled Congress to load up budgets with hand out programs. No use even trying to cut, the fiscal experts say.

This attitude reflects a lack of any disposition to put up a fight for budget reduction. Even though next year's receipts probably will match—or exceed slightly—revenues, there is little likelihood that the savings will be passed on to the taxpayer in the form of lower tax rates or even payments on the national debt.

Reason for the $3 billion-plus increase in spending starting July 1, 1960, is that we are now about to move into the period of paying for some of the more expensive missile and outer-space projects. These built-in increases, as the Budget Bureau calls them, are just now beginning to show up under "accounts payable" although the projects were voted two, three, and even four years ago.

Defense contractors can continue to include in contract costs the advertising they place in trade and technical publications. No reversal of this policy is planned by the Defense Dept., despite recent complaints in Washington concerning contractors' ads.

ON THE REGAL IMPERIAL

... AND THE MAGNETIC

CHRYSLER

the sales-making gleam of

Superior Stainless

STRIP STEEL

At Chrysler Corporation, fine automotive engineering and fine motorcar appearance go hand-in-hand. That's why Chrysler specifies *stainless steel* for essential exterior brightwork where beauty must equal performance, year after service year. ● For over 25 years CHRYSLER has been a regular user of quality stainless strip steel from the mills of Superior Steel—a privilege and responsibility we are happy to uphold.

SUPERIOR STEEL DIVISION

OF

COPPERWELD STEEL COMPANY

CARNEGIE, PENNSYLVANIA

For Export: Copperweld Steel International Company, New York

CHEMICAL PREPAINT TREATMENTS FOR METAL SURFACES

What they do, the types available, how they are applied

By J. H. GEYER, Manager, Product Development Dept., AMCHEM PRODUCTS, INC.

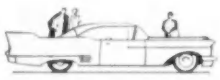
Paint systems have been steadily improved in an effort to produce more decorative, easier-to-apply, and more corrosion-resistant films. The ability, however, of any paint film to perform its predetermined functions cannot be fully utilized without properly preparing the metal surface.

Chemical *prepaint* treatments are designed to do four jobs and do them well. First, they remove organic soils, shop dirt, scale, and rust or corrosion products from the metal surface. Second, they provide surfaces that are completely compatible with subsequent paint films. Third, they produce a *tooth* that promotes good paint film adhesion. Fourth, they effectively prevent underpaint corrosion growth after any breakthrough in the paint film.

Basically, there are four types of chemical prepaint treatments—phosphoric acid, iron phosphate, zinc phosphate, and amorphous phosphate or chromate.

Phosphoric Acid—Phosphoric acid cleaner combination materials are an example of economical chemical prepaint treatments. Amchem Deoxidine is such a material. It removes organic soils, rust, scale and contaminating elements from the metal surface. It also produces a light etch on steel, aluminum or zinc surfaces which considerably aids in increasing paint adhesion. It does not, however, form an actual coating on the metal surface. Any breakthrough in the subsequent paint film will permit underfilm corrosion to proceed. Grades of Deoxidine are available for application by brush or swab, hot and cold dip, or hot spray.

Iron Phosphate—Iron phosphating processes are extensively used in the chemical prepaint treatment of appliances—water heater shells, ranges, washers, dryers and other *white lines*. These processes will produce excellent paint-bonding films on the metal and retard or prevent underpaint corrosion. Duridine, Amchem's iron phosphating process, is a combination organic soil cleaner and iron phosphate coating material. Both the cleaning and coating operations take place in the same bath. Duridine and other iron phosphates do not lend themselves to brush-on application, are primarily designed for spray type equipment of four or five stages. But several dip installations are successfully operating today by inclusion of an alkali precleaning stage.



Zinc Phosphate—Amchem Granodine is an example of zinc phosphating, the type now being used to treat steel in the automotive industry, and predominantly specified for steel ordnance and military items. This process forms a coating which offers the ultimate in paint adhesion promotion and vastly augments the corrosion resistance of subsequent paint films. Zinc phosphate materials are extremely flexible as to method of application—can be applied by brush, dip or automatic spray equipment. In a typical dip or power spray system, the stages would be alkali clean, water rinse, zinc phosphate treatment, water rinse, acidulated final rinse. If the metal has considerable areas of rust or scale, an acid pickle is advisable following the alkali cleaning stage.

On zinc surfaces, the zinc phosphates perform a rather unique function. They act as a barrier against chemical reaction between the applied paint film and the zinc surface. This effectively prevents blistering of the paint and early breakdown of the film. This is in addition, of course, to the improvement of paint adhesion and the retarding of underpaint corrosion. Amchem Lithoform is specially designed for use over zinc surfaces and finds wide application as a prepaint treatment for ornamental zinc die castings, refrigerator liners, and on most galvanized work requiring painted finishes.

Amorphous Phosphate and Chromate—These coatings are the films produced by the Amchem Alodine processes and similar ones on aluminum surfaces. They have met with wide acceptance in the prepaint treatment of venetian blind strips, refrigerator liners, aluminum heat transfer units, aircraft sheet metal assemblies, and many other items fabricated from aluminum. The various coatings provide an excellent film for the promotion of paint adhesion and effectively prevent underfilm corrosion. As in the case of zinc, aluminum exhibits a tendency to chemically react with some paint systems. The Alodine processes develop a barrier film between the paint and the aluminum surfaces which prevents this reaction. The Alodines are extremely versatile materials that can be applied to aluminum surfaces by brush, hand spray, dipping, or mechanical spraying. Brush application is particularly well adapted to the processing of parts too large for simple dip systems or in manufacturing operations that do not warrant a tank setup. In dip or spray application, the system usually consists of an alkaline preclean, a water rinse, the Alodine treatment, a water rinse, and an acidulated final rinse. Where the surface is heavily oxidized, a deoxidizer in the line is needed.

For more complete information about any one or all of these chemical conversion coatings, contact an Amchem sales representative or write us at Ambler 28, Pa.

World's first "screech-free" tire!

GIVES CARS MANY NEW SELLING FEATURES

Since Enjay Butyl absorbs shock better than any other rubber, tires made from this amazing rubber offer revolutionary improvements in the riding and handling characteristics of any car. They eliminate, or at least minimize, major engineering changes to overcome vibration and noise. Tires of Butyl provide all these riding qualities—for any car:

- **The BUTYL RIDE** is safer . . . stopping distances have been reduced as much as 30%. Butyl tires *even stop faster on wet surfaces than other tires do on dry.*
- **The BUTYL RIDE** is smoother . . . tires of Butyl tend to flow over road irregularities — shock absorbent ride practically eliminates road-seam "thumping".
- **The BUTYL RIDE** is quieter...you can't make Butyl tires screech at any corner, at any speed—even in panic stops. Running noise and vibration are measurably reduced.
- **And BUTYL TIRES** resist ozone, sunlight and weathering. After long service, sidewalls keep their shiny "new-tire look," are virtually immune to cracking, aging.

Let us show you how tires of Butyl can help you sell more cars. *For complete information* . . . write or phone your nearest Enjay office. Our expert staff is always willing to provide information and technical assistance upon request.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

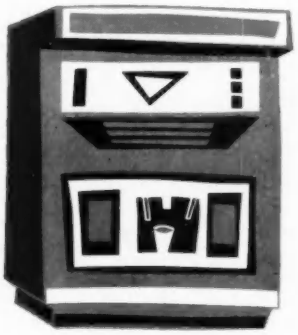
ENJAY BUTYL

ENJAY COMPANY, INC., *15 West 51st St., New York 19, N. Y. Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa*

Looking for a bright idea for your product?

LOOK TO BROWN LIPE CHAPIN

HOME APPLIANCES



VENDING MACHINES

BUSINESS MACHINES

MUSIC & COMMUNICATIONS

An experienced source of decorative and functional die castings and stampings!

Consider Brown-Lipe-Chapin when you're planning ways of adding "hard sell" to your product. Brown-Lipe-Chapin, with extensive facilities for die casting, metal stamping—including steel and aluminum, and electroplating, can help give your product distinctive new eye appeal with a new dimension in durability.

YOU GET A CREATIVE APPROACH

Brown-Lipe-Chapin, experienced in providing the mass-consumer field with quality bright work, takes a creative approach to your design problems. An experienced staff of engineers work out the best and most economical method of producing your parts.

YOU RECEIVE CONSTRUCTIVE ASSISTANCE

You can count on Brown-Lipe-Chapin for constructive suggestions that often add up to savings in time and money. They'll tackle your most difficult part . . . even if it's up to six feet in length. And complete facilities for die casting, steel or aluminum stamping, anodizing, electroplating and painting are all under one roof.

YOU BENEFIT FROM RELIABILITY BY BROWN-LIPE-CHAPIN

You're assured of reliability with Brown-Lipe-Chapin . . . *reliability* in step-by-step quality control, work performed by craftsmen who are experienced in meeting the rigid specifications of the automotive industry . . . *reliability* in meeting your delivery schedules right on time . . . *reliability* in facilities that can be quickly converted to model change-overs . . . and *reliability* as a continued source of supply. Brown-Lipe-Chapin will guarantee to supply your requirements for die casting and stamping for as long as you may want to specify.

Brown-Lipe-Chapin's two plants, in Syracuse, New York and Elyria, Ohio, combine 25 acres of modern plant facilities that are ready to go to work for you now. So, before the die is cast on your product designs, contact Brown-Lipe-Chapin, Division of General Motors Corporation, Syracuse, New York.

GM GENERAL MOTORS

RELIABILITY by BROWN·LIPE·CHAPIN

DIVISION OF GENERAL MOTORS CORPORATION

Gas Hardened Cores at IHC Plant

(*Continued from page* 77)

the effect of the gas, the necessary time decreasing as the pressure of the gas at the regulator valve increases. In the International Harvester operation, the gas flows for about 8 sec at 10-15 psi pressure. A total amount of about 1 lb of gas to 50 lb of mixed sand is used. The cores by that time have set up, and can be removed from the core boxes.

Removal of the cores from the core boxes is accomplished by an ingenious means. Compressed air is turned into the core box through the same vents that admitted the carbon dioxide gas, and the higher pressure of the compressed air lifts the core about an inch, so that it can be easily lifted out.

The hardened cores are placed on a small belt conveyor immediately behind the operator, run through a drying tunnel where they are exposed to heat for two or three minutes, and continue to the end of the conveyor, 32 ft long, for assembly and transfer to the pouring conveyor. This conveyor, 62 ft long, runs in the opposite direction. At the beginning of its run a protective sprinkling of sand is run onto the conveyor, and the chill rings are assembled with the cores. Weights are placed on top of the dry-sand mold, and the castings are poured manually from a large ladle. Toward the end of the conveyor travel the molds are shaken out, the chill rings are quenched and placed on another conveyor and returned to the assembly station, and the castings are then moved to the cleaning room.

Savings in the gassed-core fabrication arise primarily from the elimination of the hand-ramming of the cores, the elimination of the core-baking element, and the elimination of several assembly operations. The number of operations has been reduced from more than 60 to about 15 principally because of the preceding simplification and because of the reduced number of handling operations. Furthermore, the measures necessary to produce a casting are accomplished in the immediate vicinity of the molding station as compared to the oil sand application some distance away.

Harvester engineers have estimated that the cost of the sand, gas, and binder now used is a little below that cost of the oil-sand mix. Processing costs are definitely lower. Important supplementary savings are made in handling costs. The dimensional stability of the gassed cores is greater, so that a greater percentage of the pieces will be closer to dimension, but the size range, or tolerance requirement, is about the same as with the oil-sand cores. The gassed cores are probably not as strong as the baked cores, so they should not be moved about more than is necessary. The entry of the gas through strategically placed vent openings into

the core box seems to give better and more rapid diffusion of the gas through the sand mixture.

The gas process is not intended to supplant present oil sand core making operations, but it is believed that greater use can be made of its utility. Further, the application need not be limited to the core room. It can be extended to the molding department as well. IH's Milwaukee Works has had satisfactory results with either application. ■

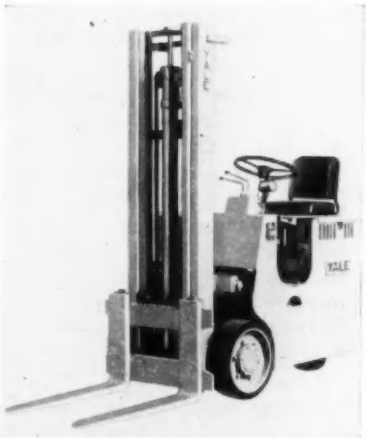
NEW PRODUCTION EQUIPMENT

(*Continued from page* 84)

6000 Lb Electric Truck

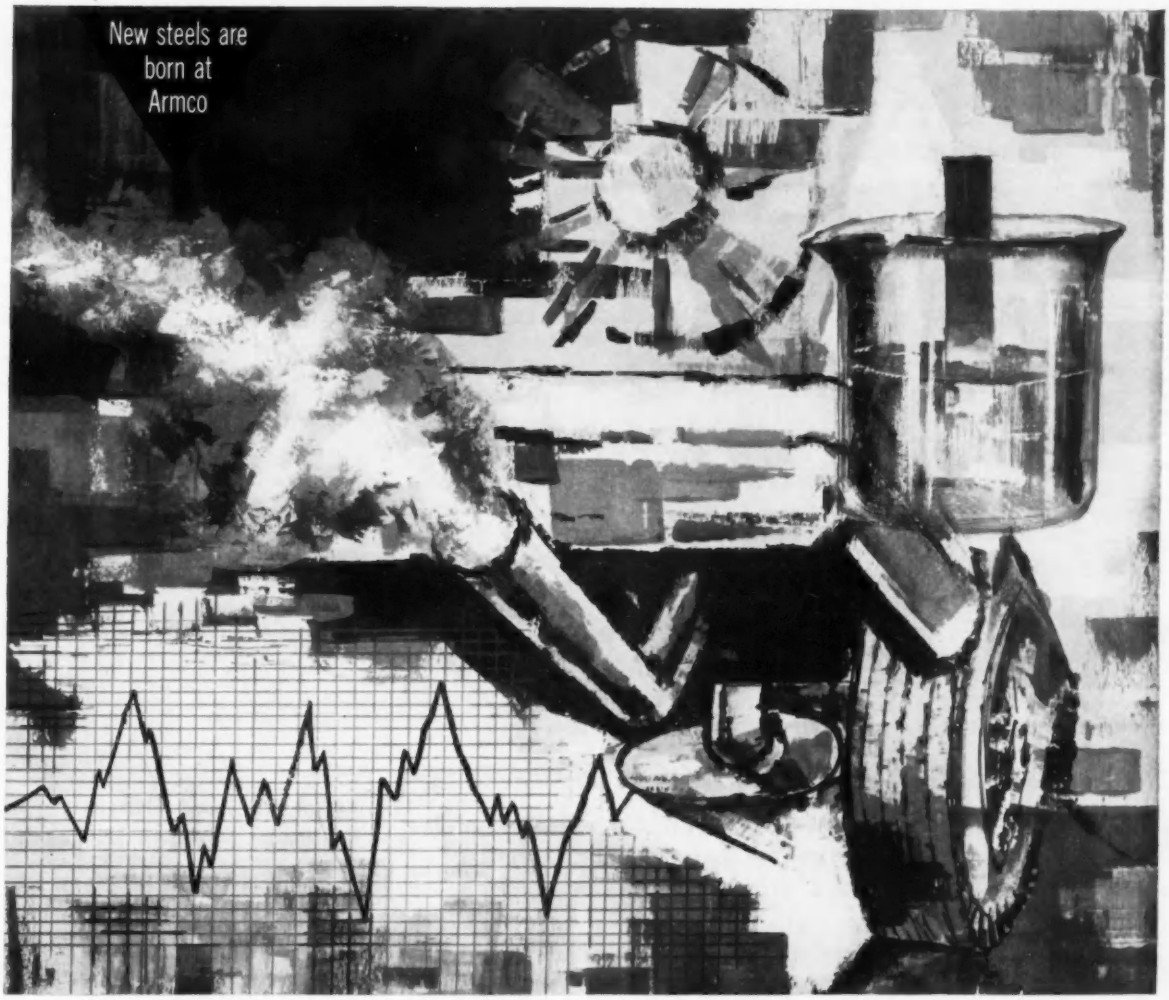
To speed handling of large loads in narrow space saving aisles with high electrical efficiency, the *Yale Materials Handling Div. of The Yale & Towne Mfg. Co.* has introduced a 6000 lb capacity truck featuring a resistorless control.

The control draws current from the battery at a proportionate rate to the speed of the truck giving a low starting current draw but with no sacrifice to starting torque.



Yale & Towne 6000 lb capacity lift truck

Lifting speeds are 45 to 50 fpm unloaded and 25 to 30 fpm under load. When unloaded, the truck's traveling speed is 6 to 6½ mph; loaded is 5½ to 6 mph.



Armco ALUMINIZED STEEL

thwarts heat and corrosion...doubles muffler life

No metal in its price class can match Armco ALUMINIZED STEEL in resistance to a combination of heat and corrosion.

Outstanding durability of this special hot-dip aluminum-coated steel is of particular advantage in auto mufflers, where fiery heat and corrosive exhaust liquids combine to destroy uncoated steels. Actual 7 year road tests show that mufflers of Armco ALUMINIZED STEEL normally last at least twice as long as those of ordinary carbon steel.

This double life makes a strong selling feature. With early failures reduced, mufflers are much more likely to span the vital first-owner period.

Get all the facts on this economical steel for longer-lasting mufflers. Write: Armco Steel Corporation, 2219 Curtis Street, Middletown, Ohio.

ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

Circle 162 on Inquiry Card, for more data

MACHINERY NEWS

(*Continued from page* 90)

of a 90-deg step in the wheel, by employing an angled lifting ramp with a gravity-held follower in contact with the form bar.

The grinding wheel head has a cast iron body which moves on hand-scraped ways (not anti-friction)—felt by company engineers to provide better vibration-damping with less wheel-head and feed-screw mass. Wheel feed adjustment is made by a handwheel with a click-count index graduated to 50 millionths of an inch that actuates a rotating feed screw engaging a large half nut mounted on the bottom of the head. There is also a long lever at the end of the machine for manual in-feed control. While the machine is basically designed for manual control, an automatic plunge-feed accessory with single lever control is available as an extra.

Machine Tool Official Explores Foreign Moves

The most serious and far-reaching consequences stemming from the wage-price spiral is the increasing number of American firms being forced to build plants abroad to protect their markets. Adoption of new technologies at a fast pace, permitting increased productivity, seems to be the major answer.

These were among the views expressed last month by Ralph E. Cross, executive vice-president of The Cross Co., before The Institute of Labor and Industrial Relations at St. Clair, Mich. The occasion was the summer management conference of the Institute co-sponsored by the University of Michigan and Michigan State University.

This well-known machine tool executive warned that continuation of the wage-price trend will create voids in the nation's economy and a serious drain on future growth, economic expansion and prosperity. In making his point, Cross emphasized the importance of capital goods dollars on growth and employment. He declared that industry must invest $40 billion annually

Each has his own reasons why **FORD INDUSTRIAL ENGINES**

best meet new equipment requirements

EQUIPMENT DESIGNER: "The engines we use must be compact, durable and efficient. We find Ford's space-saving construction with high power-to-weight ratio gives us greater freedom of design. And thanks to Ford's wide range of engines and the consulting services of the Ford Sales Engineer, we get Ford power that's tailored to our needs."

SALES MANAGER: "Most of our customers are pre-sold on Ford power. They know Ford engines are dependable and economical. We recommend Ford power because it pays off in satisfied customers and repeat sales!"

SERVICE MANAGER: "Ford's world-wide service facilities are second to none! Our dealers report customers have less downtime because they get prompt service from Ford Dealers everywhere."

PURCHASING AGENT: "Due to modern production methods, we get Ford engines at low initial cost. And when increased sales suddenly boost production, Ford provides speedy delivery service to fill our orders."

COMPANY PRESIDENT: "Since our products are no better than the engines that power them, we insist on the best—Ford Industrial Engines. Built and backed by one of the world's most successful manufacturers, they protect our reputation and customers' investments."

FORD SALES ENGINEER: "Ford Industrial Engines range from 134 to 534 cubic inches. *All* are available as engine assemblies or power units. We will be happy to recommend the right engine for your application — or help you solve any other power problem you have. For complete information, write Ford Industrial Engine Department, Ford Division, Ford Motor Company, P. O. 598, Dearborn, Michigan."

Ford

INDUSTRIAL ENGINES
AND POWER UNITS

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED!

in plant and machinery to maintain jobs in existence today and to provide jobs for the 400,000 to 500,000 people entering the labor force each year.

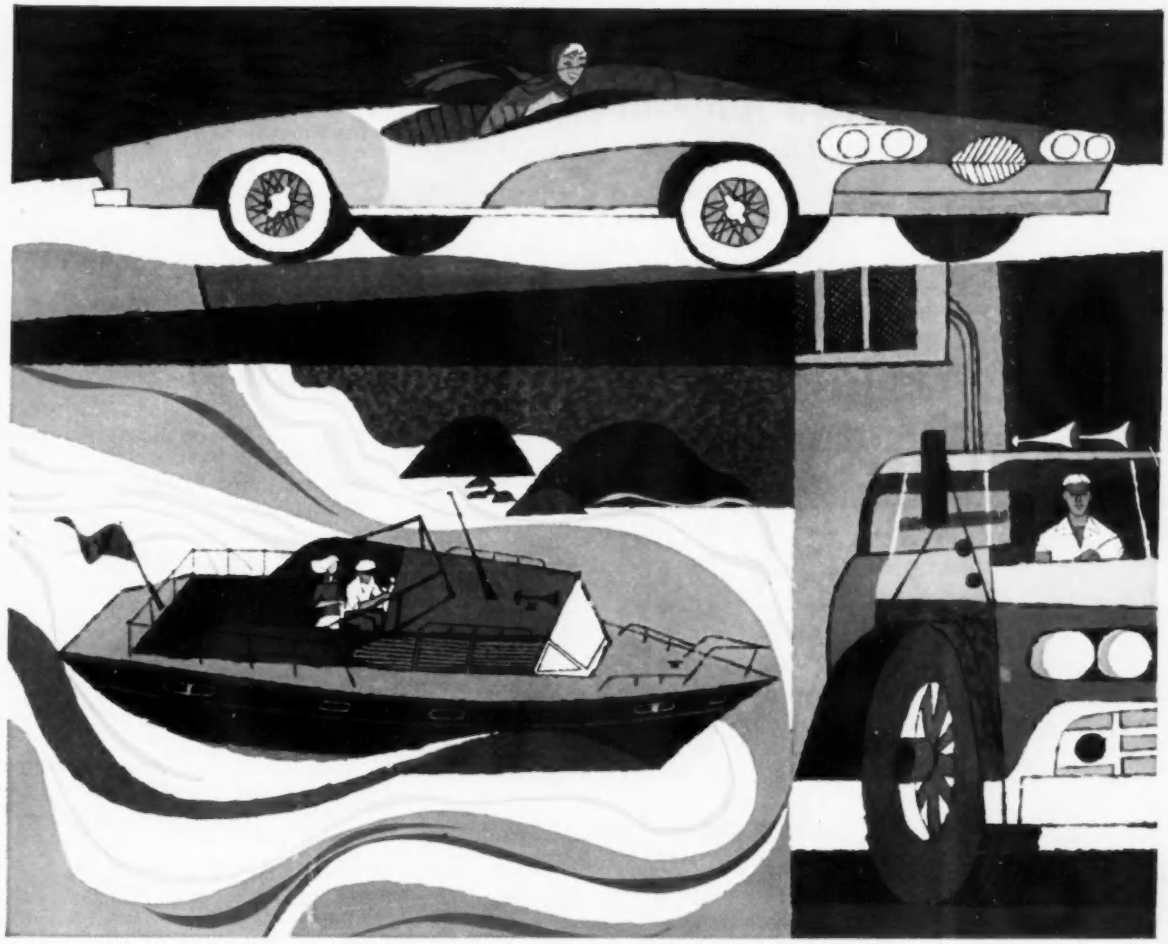
"When money is diverted to foreign plants and equipment, the U. S. not only loses the capital required to create job opportunities, but also loses reservoirs of future profits and taxes," he said. Or, expressing the situation another way, some of the very capital needed for investment in new products, materials and production methods necessary to make U. S. firms competitively superior to firms abroad is being exported.

Cross observed, however, that this is the only alternative facing American business firms that cannot compete in world markets or in its own markets. "It is cheaper in more and more cases to make a U. S. product in Europe and ship it across the ocean, than it is to make it here at home," he stated.

Among other things, he sharply criticised attempts to boost trade barriers and efforts by labor union executives to force wages up in Europe on the one hand, while attempting to restrict the application of technology in this country.

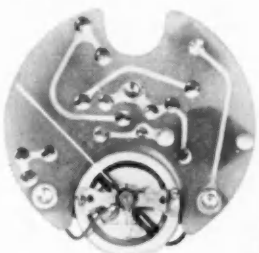
"There is only one road to a high standard of living and to full employment," he said, "and that is through the acceleration of technological progress." To accomplish this end, Cross proposed several areas deserving utmost attention: accelerated research, increased productivity, progressive depreciation policies, and incentives for investment.

In effect, he feels that if we are to maintain competitive superiority, we must have a high rate of technological progress and provide proper incentives for business to keep pumping large amounts of capital into new products, plants and equipment.



TACH PROBLEMS? LOOK TO AC!

Exterior of electronic impulse-type diode tachometer



View with outer shell removed

This new electronic tachometer is available for original equipment only from AC for use in automotive, marine and industrial applications. It combines high precision and low cost in a one-unit tachometer. In fact this tachometer is priced at less than the cost of presently produced electric units.

Easy to install: One wire connection for grounded systems; two wires for ungrounded systems.

Easy to read: Wide 100° pointer deflection in attractive internally or externally lighted case.

Reliable: No moving parts (except pointer), no batteries or electrical contacts to fail. Uses time-tested electronic parts designed for a lifetime of operation. High precision, rugged, core-type meter movement is impervious to external magnetic fields. It is available for 6, 12 or 24-volt systems plus magneto-type ignition, either in panel or as a separate unit.

What does it do? It indicates rpm of automotive, commercial and marine engines by means of a diode counter which counts ignition impulses. This counting is done by charging a capacitor during the open phase of the distributor contacts and discharging the capacitor through the core-type movement during the closed phase. As engine speed increases, distributor rpm increases, the ignition pulse rate increases and the pointer deflection increases proportionately. In addition, it can also be used for measuring frequency and/or rotation of alternating current electrical machinery.

If you have a problem with tachometers, or would like additional information about the new AC electronic type, write or call any AC office. We will be happy to supply you with complete information.

AC Reliable Products Help You Sell

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

FLINT—1300 North Dort Highway, CEdar 4-5611 **CHICAGO**—7074 North Western Avenue, ROgers Park 4-9700 **DETROIT**—General Motors Building, TRinity 5-2630

Circle 166 on Inquiry Card, for more data

World-Wide Markets Loom Ahead for American Automobiles

(*Continued from page* 63)

from voluntary dues and contributions and the sale of published standards. It receives no Government funds. Its services, however, are available to all, member and nonmember alike, including Government agencies.

More than 1850 American Standards have been approved to date. About 400 technical committees are presently working under ASA procedures on the development of American Standards. Responsible for all technical activities of ASA is the Standards Council, composed of representatives of each member body. The Standards Council, delegates supervision of the overall program to 14 Standards Boards, each of which is responsible for a special field.

The automotive industry is represented on the Safety Standards Board, Highway Traffic Standards Board, Mechanical Standards Board, Graphic Standards Board, and the Nuclear Standards Board. In addition, many industry representatives are members of ASA Sectional Committees, which do the actual work of drawing up standards. SAE and AMA have sponsored several ASA sectional committees. It is on these ASA sectional committees that representatives of the automotive industries can meet with members of other industries and national groups to discuss mutual standards problems and to develop standards of national acceptance. According to ASA rules, membership of a sectional committee has to be truly representative of all national groups substantially concerned with its work.

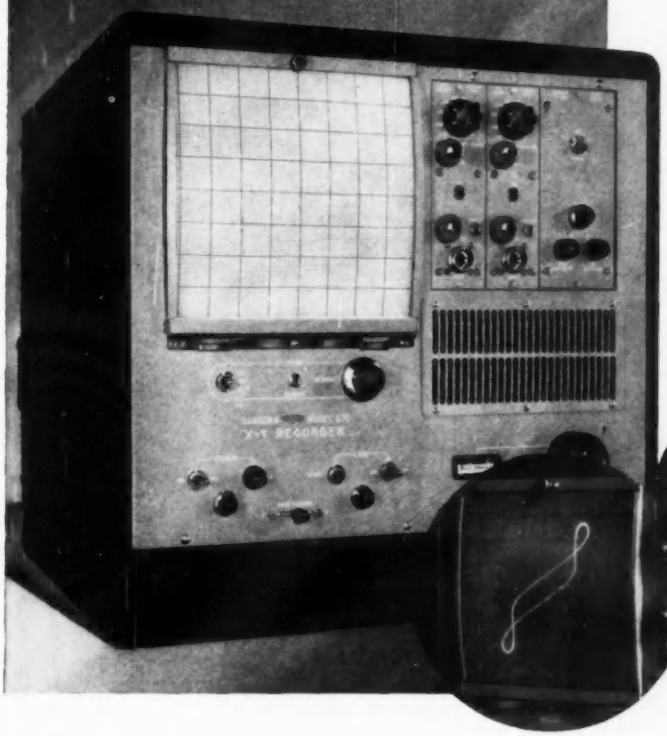
Of foremost interest to the automotive industries is ASA Sectional Committee B1, Screw Threads, sponsored jointly by SAE and The American Society of Mechanical Engineers. This committee, which has several subcommittees, is responsible for the Unified Screw Thread, which has only recently become a practical reality after almost 50 years of patient committee work. SAE, representing the largest single user of screws, bolts, nuts, and other threaded parts, has made a significant contribution in lending its prestige and weight to the successful completion of the project. In ASA sectional committee work, SAE generally presents the coordinated viewpoint of the automotive and related industries as well as various facets of the aircraft industries.

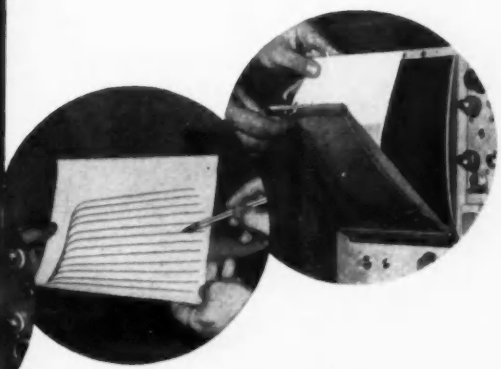
Many contributions have been made by individual members of the automotive industries to the solution of the technical problems of the Unified Screw Thread. While it is impossible to give credit to all of them, mention should be made of R. F. Holmes, standards engineer, A. C. Spark Plug Division, General Motors

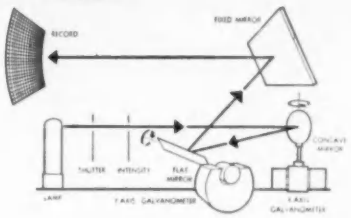
(*Turn to page* 138 *please*)

100 CPS X-Y RECORDING

with immediate readout







THE NEW SANBORN MODEL 670 OPTICAL X-Y RECORDER HAS

- 1% linearity
- frequency response 3 db down at 130 cps independent of amplitude
- writing speeds to 2500 in/sec.
- 8" x 8" direct print paper chart
- trace monitoring on phosphorescent screen

X-Y RECORDING never before possible with electro-mechanical instruments can now be done with the new Sanborn Model 670 X-Y Recorder. Direct writing on ultraviolet-sensitive recording paper by a beam deflected by optical galvanometers makes possible the combination of fast writing speed and 130 cps frequency response not found in any other X-Y recorder. Transistor characteristics, acceleration and vibration of mechanical parts and events of similar short duration can be recorded with linearity of *1% of full-scale* and at trace speeds as fast as *2500 inches per second*. Square wave response exhibits no greater than $\frac{1}{2}\%$ overshoot *at any amplitude;* sensitivities as high as 62.5 uv/inch (depending on preamplifier used).

PLOTS OCCUPY AN 8" x 8" RECORDING AREA and can be previewed or monitored on the instrument's phosphorescent screen. An Axis Record switch to print X and Y axes on the record, and a Beam Intensity Control to assure maximum trace clarity, are among the front panel controls provided. An 8" x 8" sheet of the ultraviolet-sensitive chart paper (stored in drawer at base of cabinet) is easily placed on the back of the hinged screen. Brief post exposure in normal room light is the only developing process.

OPTIONAL INTERCHANGEABLE PREAMPLIFIERS for each axis presently include the Model 850-1300B DC Coupling and Model 850-1200 Phase Sensitive Demodulator; a Carrier Preamplifier, High Gain Preamplifier and a time base generator are now in development. Driver Amplifiers are compact, fully transistorized plug-in units with single-ended input and output. Galvanometers are low resistance, low voltage units of rugged, enclosed construction; sensitivity and damping are independent of coil temperature. Accessible, unitized circuitry also extends to the power supplies—a front-panel plug-in for both preamplifiers and a second supply for both driver amplifiers. A built-in blower provides constant, forced filtered air cooling. The Recorder can be rack mounted in 15¾" of panel space, or housed in its own 20" x 20" x 21¼" optional portable cabinet.

Ask your local Sanborn Sales-Engineering Representative for complete information on the Model 670 X-Y Recorder, or write the Industrial Division in Waltham, Mass.

SANBORN COMPANY

INDUSTRIAL DIVISION

175 WYMAN STREET, WALTHAM 54, MASS.

Circle 168 on Inquiry Card, for more data

Circle 169 on Inquiry Card, for more data →

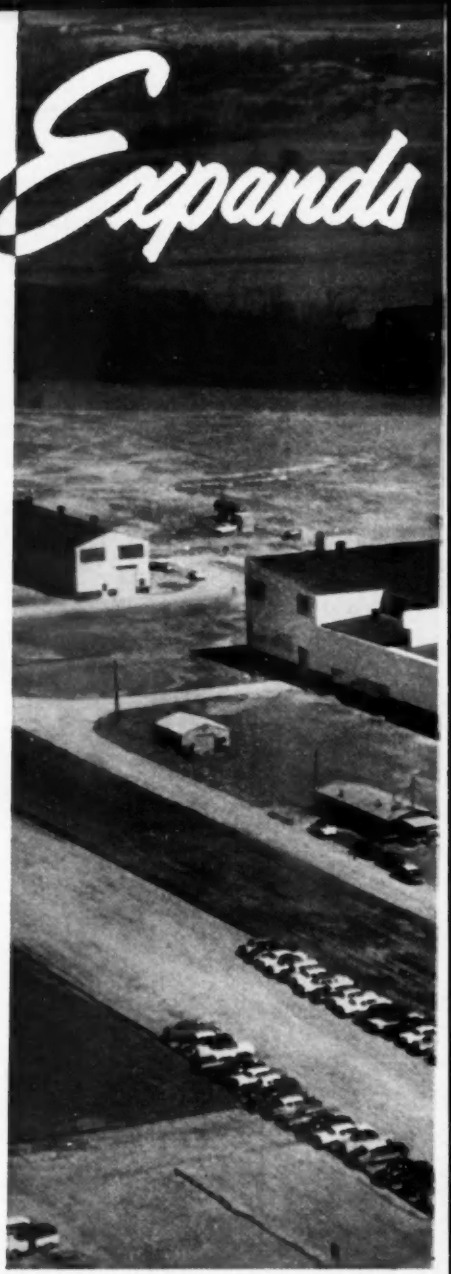
UNIVERSAL-CYCLOPS STEEL *Expands*

. . . with a New Plant and New Cold Finishing Facilities at Coshocton, Ohio

Universal-Cyclops, one of the leading producers of cold rolled stainless steel strip, announces the opening of a new plant at Coshocton, Ohio, which will supplement our facilities at Bridgeville, Pa., and greatly augment production capacity to meet the ever-increasing demands for UNILOY® Stainless Steel.

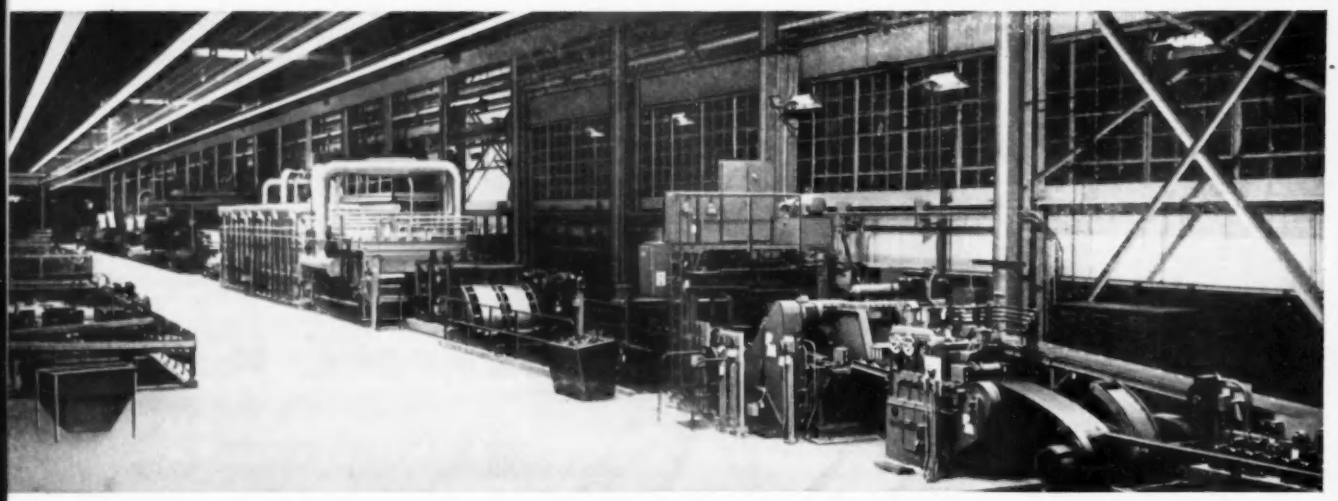
Completely new, this modern plant represents a major step in our corporate expansion program. It provides the finest facilities, production skills, engineering and metallurgical experience. It conforms to the policies maintained throughout our 75 year history, to constantly strive for highest quality standards in our products.

Customer oriented throughout, personnel and equipment are geared to meet the needs of our customers. Large stocks of finished coils are maintained at all times for prompt delivery.



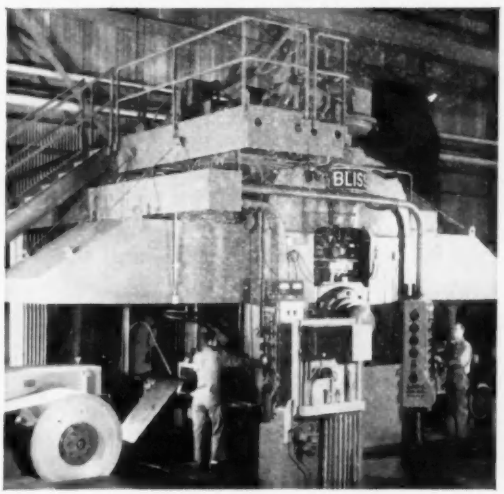
UNIVERSAL CYCLOPS
UC STEEL
STEEL CORPORATION
Bridgeville, Pa.

STAINLESS STEELS
TOOL STEELS • HIGH TEMPERATURE METALS

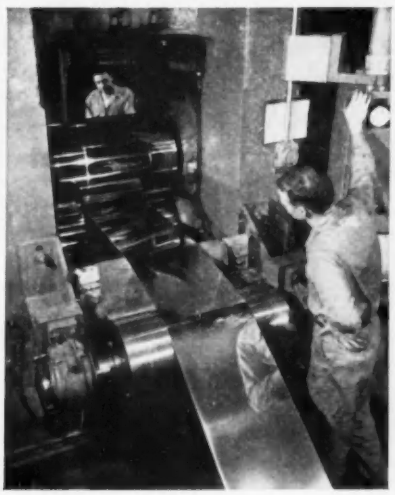


The most modern annealing and pickling line in the industry—over 600 ft. long. Handles two coils up to 24″ width.

Stainless Strip Capacity



Modern four-high cold rolling mill.



Temper mill provides top quality finish.

Large stocks of stainless steel coils—assure prompt delivery.

Daimler-Benz Stuttgart Plant

(*Continued from page* 80)

rams and presses the bushings home.

Transfer equipment is used for machining most of the major chassis and engine components, and the longest combined line at Untertürkheim, operating on a 3½-minute cycle, is for four-cylinder engine blocks. The first section has four work stations where the head and pan faces are rough and finish milled and the main bearings machined. Built by Heller, but with Daimler-Benz unit heads, it has five opposed and staggered horizontal milling heads carried on a common slide and moving as a unit, and also incorporates the transfer mechanism.

Slide travel during the cutting stroke is in the direction of the head of the line. After the pass is completed the longitudinal transfer bar indexes radially to engage the four blocks in the machine, plus the incoming block on the loading rails. As the slide fast-returns it advances the first four blocks to their next work stations and ejects the fifth one from the line. Blocks are then clamped downwards against the rails by rams overhanging the central bed, and the work stroke repeats. Crank bearings are milled at the last station by cutters on a longitudinal spindle as this head traverses with the others.

Following a turn-over fixture the blocks are fed head-face-up into a two-station section that rough-bores alternate cylinders in pairs and mills both sides of the casting with traveling heads. Work is transferred as before. After this comes another Heller section for milling the block ends and various mounting faces, and then an 11-station Burkhardt & Weber line for drilling, boring and tapping.

Final machining on the block line is on a 9-station section integrating three machines for skim-milling, finish boring and honing. The same transfer arrangement as on the Heller units is applied, with the traveling head on the Daimler-Benz-built vertical miller carrying the full-length transfer bar with it as it feeds across the block to remove 0.019 in. from the head face, then moving all the blocks forward as it fast-returns.

Cylinders are finish-bored in two stages on a Burr four-station machine with two vertical spindles on each head. Here again the bores are machined in alternate pairs, with the first cut taking 0.039 in. and the second 0.019 in.

Bores are finished on a Nagel 4-station honer which works one block at a time with each of its four independent spindles. Cutting stones are expanded hydraulically after the head feeds down into the cylinder. Automatic sizing is effected by a machined collar carried on the spindle that drops into the

Earthmoving muscles from tubes of steel

A construction site springs to life as earthmoving equipment tugs, scoops, heaves and rips away at the earth's skin. It's grueling work!

That burly dozer. It's precision built! It's strong! Its massive blade can tear the side out of a hill. Yet, it's nimble, too. In spite of a crab-like figure, it can stop with a jolt, back off, spin, dig in and charge with the force of a galloping rhinoceros.

Power is jammed into these machines. That's why they're built with the toughest, most durable materials in the world. For years, leading manufacturers have chosen USS Shelby Seamless Mechanical Steel Tubing for hydraulic cylinders, tractor pins, bushings and more than 100 other vital parts in earthmoving, rockmoving, grading and all types of heavy mobile equipment. *Why?* Because Shelby Seamless Tubing is ideal for the fabrication of machine parts subject to bruising performance and long wear.

USS Shelby Seamless Mechanical Steel Tubing is another product from the world's largest manufacturer of tubular materials. For more than 80 years, National Tube has been foremost in building and industrial pipe applications. For more information, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS and Shelby are registered trademarks

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National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
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bore when the prescribed diameter is reached.

This action releases a weighted ring above to fall and trip a microswitch, causing the honing spindle to retract. Operation of this machine is hydraulic, with spindle strokes varied by adjustable stops. Bores of completed blocks leaving the line are then manually checked with an air gage.

Another production highlight at Untertürkheim is a rotary indexing machine for assembling four-cylinder crankshafts. Built by Daimler-Benz, it has a total of eight stations, with work clamped in swiveling fixtures that are carried on a ring circulating around the central column. Two men operate the machine, and normal output is 23 shafts per hour.

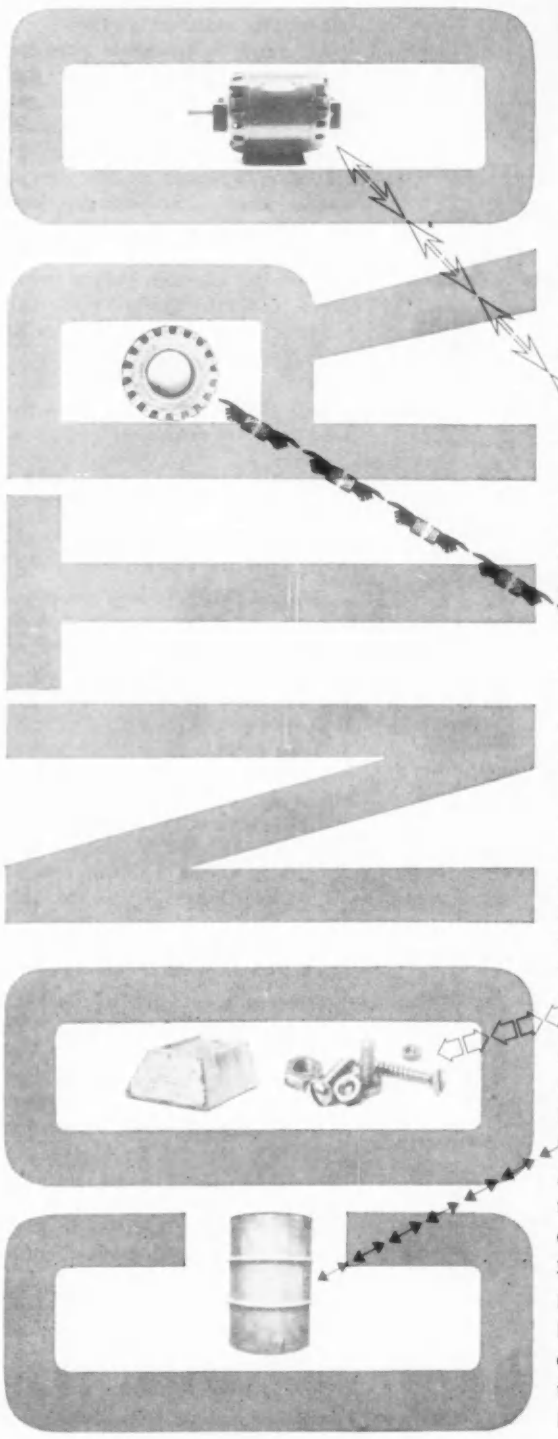
Power-indexing of the work-carrier is controlled by interlocked pushbuttons duplicated for each operator. The ring-shaped table can advance only when both operators have signalled completion of their respective jobs, this being registered at the two work positions by cross-wired indicator lamps.

The unit was originally built with eight stations, but as a result of experience the full cycle has been telescoped into six, thus reducing operator movement by confining the work of each to a smaller floor area. At the load-unload station the first operator clamps a shaft front-end-up in the vertical fixture. At the second station he inserts a semi-circular key in the milled slot, presses it in with a small horizontal hydraulic ram mounted on the column behind the shaft nose, aligns the timing chain sprocket with the key and presses it home with an overhead vertical ram, then positions and presses on the front counterweight which is scaled for engine timing.

Operations at the next two stations are automatic, with cycling controlled by table indexing. At No. 3 two lock-pin holes are drilled in the mating circumference between the counterweight and shaft, and at No. 4 they are reamed out. In both cases the holes are cleared of chips by compressed air.

The second operator takes over at station No. 5, starting by in-

INVENTORY



PUT YOURSELF IN FULL COMMAND OF INVENTORY WITH IBM DATA PROCESSING

What do we have on hand? What are our immediate needs? What will we need in the future? When do we reorder?

With new IBM inventory control methods, you not only answer questions like these precisely, but you also keep inventories at optimum levels . . . reduce shortages . . . cut inventory carrying charges . . . get automatic calculation of materials requirements and ordering quantities.

Results of such control? One manufacturer cut a 24-day inventory reporting cycle down to 24 hours with an IBM 650. Another realized substantial savings by cutting his inventory investment **in half** with an IBM RAMAC® 305.

COMPLETE MANUFACTURING CONTROL

Not in inventory control alone—but in every area of manufacturing—from machine scheduling to market forecasting, from engineering planning to cost analysis, new IBM techniques are revolutionizing management control of manufacturing. In scores of companies, IBM data processing systems are supplying information once impossible to obtain . . . closing the time lag between fact and report . . . and reducing the over-all costs of production.

All these benefits can be brought to your business, too, with methods drawn from IBM's many years of experience.

For all the facts on IBM Data Processing, and complete details on IBM Inventory and Manufacturing Control Methods, call your local IBM representative.

IBM®
DATA PROCESSING

serting and hammering in the two lock pins. He then inverts the fixture by releasing its swiveling base with a foot treadle. With the flywheel-end now uppermost, he countersinks the mounting-flange holes with an electric hand drill, hammers in the locating dowel, positions the flywheel, and inserts the bolts in the six holes.

Stations 6 and 7, now idle, were originally for automatic countersinking of the flange holes with a six-spindle power head, and assembling the flywheel and mounting bolts. With the present sequence this work has already been done.

At the final station the first operator tightens the six bolts with a vertical three-spindle power wrench whose socket-cluster indexes 60 deg between manual downstrokes. Back at the first station the bolts are individually hand-tightened with a torque wrench, the completed crankshaft is unloaded, and the fixture re-inverted to receive a new shaft.

At the time of this visit a similar eight-station machine for assembling 6-cylinder crankshafts was being installed. This incorporates a few more automatic operations, notably feeding in the lock-pins and dowels from supply magazines, and pressing them in with self-cycling stationary rams.

All major components produced at Untertürkheim — engines with gearboxes, and front and rear axle units—are conveyed on monorail circuits to the loading bay for transport by road to the car assembly plant at Sindelfingen, some 20 miles away on the other side of Stuttgart. These assemblies are cradled in stacked pallets which are loaded into special truck-trailers by a pendant three-ton fork lift traveling on an overhead beam. ■

This is the second and final part of a two-part article.

GM Forms Polymers Dept.

General Motors has formed a new Polymers Department with Dr. Philip Weiss as head. The new organization will continue work in the field of rubbers, plastics, adhesives, special coatings. It will include paint and surface coating activities formerly handled by the Chemistry Dept. High polymers research was carried on by the Electrochemistry and Polymers Dept. of the Research Laboratories before the new group was set up.

Cars in the 49th State

America's 49th State, Alaska, is a good automobile market. The Automobile Manufacturers Association says there are 171 businesses engaged in motor transportation industries, employing more than 1250 persons, in Alaska. New car sales totaled some 3500 last year, with an additional 800 commercial vehicles. Registrations now top 67,000, and fuel consumption approaches 47 million gallons a year. Alaska has a 2000-mile primary road system and 3200-mile secondary system.

Call Crucible for stainless of uniform excellence

The lustre of Crucible stainless is achieved through precision-rolling on modern mills. Uniform physical properties are maintained by checking each heat — while electronic measuring controls ensure accurate gauge. Such methods produce coil after coil of uniform excellence. For stainless in all gauges down to .010″ and in all strip widths, call or write: Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.

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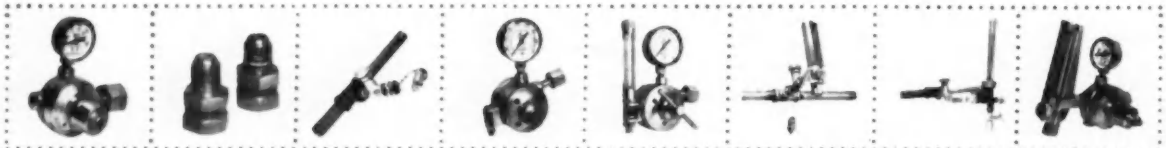
CANADIAN DISTRIBUTOR — RAILWAY AND POWER ENGINEERING CORP., LTD.

WITH AIRCO'S
COMPLETE LINE OF CONTROL DEVICES FOR
ARGON, HELIUM, CO_2, AIRCOMATIC "75"*



Single-Stage Fixed Pressure Regulator Low in cost . . . sturdy. No flow rate tampering.

Flow Adapter— Exact gas flow needed. Prevents tampering . . . saves.

"B" Station Valve for Flow Adapter —reliable shutoff. Compact, sturdy, versatile.

Fixed Pressure Two-Stage Regulator—exact gas flow needed. For two operations.

Two-Stage Flowmeter Regulator— complete flow coverage for virtually all uses.

Station Flowmeter —complete coverage. Low cost . . . extremely rugged.

Dual Range Flowmeter—complete coverage. Versatile, excellent readability.

Single-Stage Flowmeter Regulator— Rugged, compact. No heater required for CO_2.

*75% Helium, 25% Argon

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Adhesive Bonding

(*Continued from page* 76)

tion, or bend strengths certainly would be important factors in selecting the type of adhesive to use. Finally, adhesive selection also depends on whether the end product must be resistant to environmental factors, such as sunlight, abrasion, water, or solvents. Table I, based on an information form developed by Rubber & Asbestos Corp., summarizes points to be considered and discussed with adhesive suppliers for the proper selection of the right adhesive for a given application.

The user or prospective user of adhesives is best advised to call on the experienced knowledge of the supplier for assistance in selecting the best adhesive for a particular job. Adhesive manufacturers publish detailed data sheets on each of the hundreds of formulations available. However, they are the first to stress the fact that adhesives cannot generally be successfully selected from printed material because of the many variables involved.

The chances are good that the supplier has tackled and solved similar bonding problems before when called in to advise on a project. Nonetheless, it is the guiding philosophy of the adhesives industry that each situation warrants individual attention. All of the leading suppliers in the field have built their reputations as much on service as on the quality of their products.

FUTURE TRENDS IN ADHESIVES

There seems little doubt that the use of adhesives in fabrication will continue to grow at the same phenomenal rate as in the past decade. Such problems as toxicity, production control, testing methods, misapplications, economics, shelf and pot life, etc., are under constant study. Product designers are becoming increasingly aware of the merits of adhesives and the fact that joints should be designed specifically for their application.

Use of the new film adhesives should increase appreciably in the next few years. Since they are applied continuously off paper-backed rolls, they are especially well suited to automatic operations and offer one solution to the pot life problem. Film adhesives confine themselves to the immediate bonding area and insure a uniform thickness throughout the joint. Furthermore, they do not contain solvents, and waste and shrinkage are avoided.

More and more bonded parts will appear on passenger cars during the coming years, as automotive designers become more aware of their versatile advantages. The use of adhesives is most likely to expand in connection with the increased usage of plastics parts in cars. Eventually, portions of the body and chassis may be bonded on a production line basis. Once ways to cure more rapidly are found, the formulation is no problem. Metal body trim will undoubtedly be bonded, but the adhesive will have to be compatible with the finish of the car.

Aircraft designers look forward

(*Turn to page* 134, *please*)

GREATEST SINGLE IMPROVEMENT

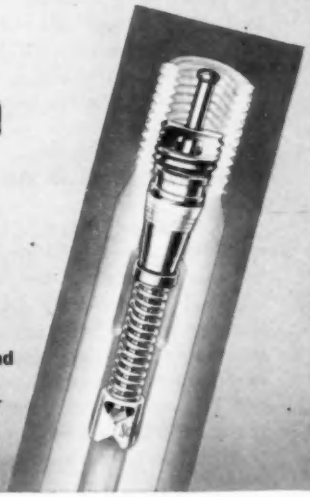
THE PLUG WASHER CAN'T STICK... "BUILT-IN LUBRICATION"

New "super-slippery" Teflon-equipped plug is self-swivelling . . . Can't stick! Core goes in easily, comes out easily—leaves valve wall clean.

NEW!

PLUS: STANDARD FULL LENGTH CONSTRUCTION

Spring-at-the-bottom—never under tension until inserted in the valve . . . and all the well-known features that have made the Schrader Valve Core the Ace of Standardization.



AIR CONTROL Since 1844

IN TIRE VALVE CORE HISTORY

Schrader Swivel-T Valve Core with plug seal of Teflon* assures most positive air seal under any operating condition

A small fraction of an ounce of precision-engineered Teflon does it. This miracle material creates a plug washer that covers a far wider range of the tire needs of modern vehicles. Tests prove temperature extremes from −100°F to 500°F do not affect this plug seal of Teflon. It shrugs off oil, water, even acids . . . has almost limitless fatigue life. And, because Teflon is the slipperiest sealing gasket substance known, the plug washer becomes its own swivel! Even under high pressure it slides like ice against ice . . . doesn't require a two-piece swivel construction to permit tightening without scuffing. The plug is now one-piece and therefore stronger.
Cores can be more precisely positioned in the valve with a wider range of tightening torques. They can't stick . . . come out easily and cleanly when removed in tire service.

Schrader original equipment tire valves are now being supplied with these new Swivel-T Valve Cores to assure the longest and most dependable service life of any tire valve ever made.

This is another Schrader contribution to help you make your vehicles more dependable.

*Teflon is a duPont trademark.

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a division of SCOVILL

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Division of Scovill Manufacturing Co., Inc.

FIRST NAME IN TIRE VALVES

FOR ORIGINAL EQUIPMENT AND REPLACEMENT

(Continued from page 131)

to the day when nearly all mechanical fasteners can be replaced with adhesives. At present, demands of the industry for adhesives to meet progressively higher temperature requirements are outstripping current adhesive capabilities. High-strength organic adhesives now available can be used at temperatures up to 450 F, if protected from oxidation, for sustained periods of service. Some adhesives on the markets can briefly withstand temperatures as high as 700 F.

Inorganic adhesives are regarded as the "white hope" of expanding adhesives technology far beyond its present limitations. These materials, capable of withstanding temperatures of 1000 F or more, are expected to take over where organic adhesives leave off. Research and development work on these wonder products of the future is being pushed today in laboratories of the adhesive manufacturers. ■

Acknowledgments

The author wishes to express his sincere appreciation to personnel of the following organizations for supplying information on adhesives and their applications:

Adhesive Engineering, Division of Hiller Aircraft Corp.
Adhesive Products Corp.
American Cyanamid Co., Plastics & Resins Div.
Armstrong Cork Co., Industrial Div.
Carl H. Biggs Co., Inc.
Ciba Co., Inc., Plastics Div.
Dow Corning Corp.
E. I. Du Pont de Nemours & Co., Inc.
Enjay Co., Inc.
Firestone Tire & Rubber Co.
General Electric Co., Silicone Products Dept.
B. F. Goodrich Industrial Products Co.
Goodyear Tire & Rubber Co.
Houghton Laboratories, Inc., Adhesives & Coatings Div.
Marblette Corp.
Marbon Chemical, Division of Borg-Warner Corp.
Minnesota Mining & Mfg. Co., Adhesives, Coatings & Sealers Div.
Monsanto Chemical Co., Plastics Div.
Narmco, Inc.
Polymer Chemical Co.
Raybestos-Manhattan, Inc., Adhesives Dept.
Rubber & Asbestos Corp.
Shawinigan Resins Corp.
Shell Chemical Corp.
UBS Chemical Corp.

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Manufacturing Methods and Processes, by A. C. Ansley, published by Chilton Co., Philadelphia, Pa.

Modern Plastics Encyclopedia, published by Breskin Publications, New York, N. Y.

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NATIONAL® OIL SEAL LOGBOOK

Oil Seal Selector Chart

The data given below indicate, for most common applications, the type of oil seal that will operate best under given conditions. Where one or more parameters are extreme, modified or special seals may be required. For engineering help or availability details, call the nearest National Seal Engineer. Look under Oil Seals, in the Yellow Pages.

50,000 series
Micro-Torc
Leather

450,000 series
Syntech
Synthetic

410,000 series
Syntech
Synthetic

MATERIAL SEALED	Mineral base oils and greases are most common materials. Availability of lubricant, criticalness of service, and cleanliness strongly influence construction choice. National Micro-Torc leather seals are recommended for grease and oil applications and particularly where semi-starved lubricant conditions may exist. For oil and fluid "zero leakage" service Syntech seals are normally considered. For applications involving both "zero leakage" and heavy dirt conditions, the user may wish to consider dual lip Syntech seals.			
SHAFT SPEED	Prime factor in seal selection. Governs all other factors. Shown in FEET PER MINUTE AS SLOW, MODERATE, HIGH.			
FPM	Slow	0 to 800	0 to 1000	0 to 1000
	Moderate	800 to 1500	1000 to 2000	1000 to 2000
	High	1500 to 2000	2000 to 3000	2000 to 3000
TEMPERATURE	Limits shown are points where sealing material or medium sealed becomes ineffective. For sealing under extreme temperature conditions, special compounds can be employed.			
LIMITS °F.	Continuous	−65° +200°	−65° +225°	−65° +225°
	Intermittent	−65° +225°	−60° +250°	−60° +250°
PRESSURE	Conventional oil seals are not pressure seals. Where pressures above those shown exist, special seals should be employed or pressure against sealing lip relieved.			
MAXIMUM PSI	Slow	15	10	10
	Moderate	10	7	7
	High	5	5	5
SHAFT FINISH	Fineness and type of finish, direction and spiral of finishing marks and leads as well as RMS value affect sealing. Polished or ground finishes with concentric finish marks are preferred.			
MAXIMUM MICRO INCHES	Slow	25	25	25
	Moderate	20	20	20
	High	20	20	20
SHAFT HARDNESS	Although shafts as soft as cold rolled steel can be sealed successfully, hardness of C20 Rockwell or greater is preferred. Fluid starvation, abrasives and high surface speeds require hard shafts.			
SUGGESTED ROCKWELL	Abrasives	above C-45	above C-45	above C-45
	No abrasives	above B-80	above B-80	above B-80
SHAFT TO BORE MISALIGNMENT	Fixed misalignment of center of shaft rotation with bore center. Concentrates wear at one side of seal. Becomes more severe as speed increases.			
TOTAL INDICATOR	Slow	.010	.015	.015
	Moderate	.005	.010	.010
	High	.005	.010	.010
SHAFT RUN-OUT	Oscillating non-concentricity between shaft and bore centers (also eccentricity or shaft whip). Run-out should be kept to absolute minimum; creates difficult sealing problem.			
TOTAL INDICATOR RPM	0-800	.010	.025	.025
	800-2200	.005	.020	.020
	2200-4200	.003	.015	.015

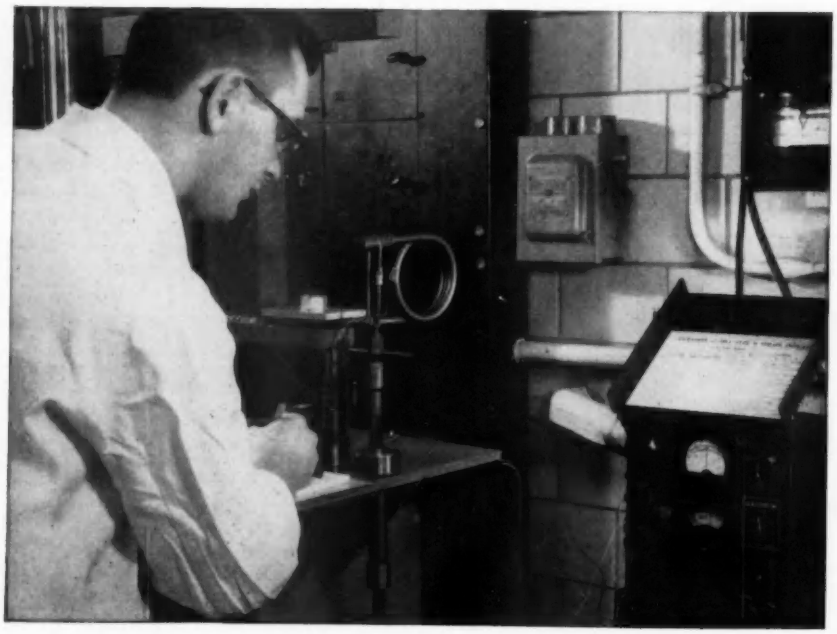
NATIONAL SEAL
Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Redwood City and Downey, California
Van Wert, Ohio

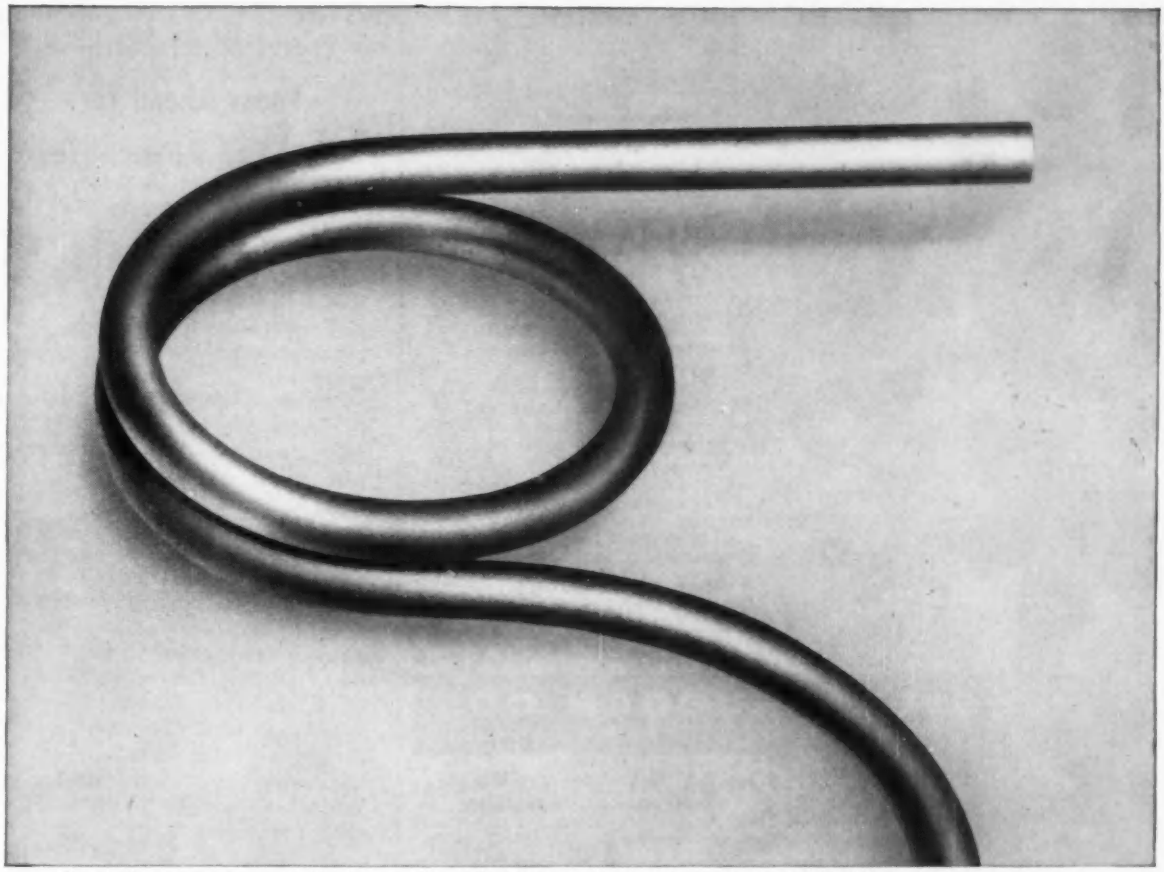
Circle 179 on Inquiry Card, for more data

20,000 chairs rock on USS American Springs without one failure

...thanks to AS&W

In the American Steel & Wire Spring Testing Laboratory, the springs recommended for the Homecrest Chair go through extensive tests. This Fatigue machine, by means of strain-gauge verification, simulates years of use in a relatively short testing time.





Here is the spring recommended by American Steel & Wire for use in this chair. To supplement the **AS&W** tests, the Homecrest Company subjected these springs to a simulated rocking test. Under a weight of 250 pounds, these springs were rocked 750,000 times, without failure.

Spring Engineering Research Service

The Homecrest Company, Wadena, Minnesota, wanted to add a swivel rocking chair to their line of modern, functional home furniture. However, they would produce this chair only if it could be a quality item that would give good, dependable service. While designing the chair, they checked with the American Steel & Wire Spring Engineering Consulting Service. The engineers studied the problem, ran extensive tests and finally recommended a pair of round wire helical single coil torsion springs. Using these springs, Homecrest designed, fabricated and marketed the chair. Today 20,000 of these chairs have been sold and not one failure of an AS&W Spring has been reported.

Mr. A. L. Englemann, a partner of Homecrest Company, says, "We have purchased from American Steel & Wire over 45,000 springs, and not one has been reported a failure. We couldn't be happier with American Steel & Wire as a supply source for our springs."

If you have a spring problem, or would like advice on the use of springs in your product, get in touch with any American Steel & Wire Sales Office. You can benefit from the knowledge of AS&W's Spring Engineering Research Service. The Service has been engaged in laboratory experiments of static and dynamic testing for 20 years and has accumulated invaluable data on stress and fatigue life of steel springs, while endeavoring to improve efficiency in the use of steels, from steel chemistry through product application, to more economically cope with today's rigorous demands. This accumulated knowledge of the AS&W Spring Engineering Research Service is at your disposal. *American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.*

USS and American are registered trademarks

American Steel & Wire
Division of USS **United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, Distributors Abroad

World-Wide Markets Loom Ahead for American Automobiles

(*Continued from page* 120)

Corp., who, together with Irving Fullmer, senior physicist of the U. S. Bureau of Standards, has provided many brilliant technical solutions.

Different screw threads among the Allies during World War II were a particularly serious handicap in our war effort. To overcome such differences, the United States, the United Kingdom, and Canada have been holding meetings since 1945 in an effort to unify their engineering standards. One of the results of this "ABC (American, British, and Canadian) Conferences on Unification of Engineering Standards" was acceptance of the Unified Thread in England and Canada. Today, about one-half of all threads made in England conform to the unified thread standard, while in Canada about two-thirds do, and in the U. S., 95 per cent.

Drafting Manual

Of almost equal importance to the automotive industries is ASA Sectional Committee Y14—American Standards Drafting Manual—sponsored jointly by The American Society of Mechanical Engineers and the American Society for Engineering Education.

The lack of uniform drafting practices among people doing engineering business with one another has been about as great a handicap as the lack of a common language would be. Hundreds of thousands of drawings every year have had to be explained or redrawn. The extra cost to industry was incalculable.

With the completion of the American Drafting Standards Manual many misunderstandings, and much waste can be eliminated. Eleven sections of the manual have already been published, with seven more to go. The SAE, representing a unified viewpoint of all automotive interests, has contrib-

(*Turn to page* 144 *please*)

Cold Bonderite Earns Supplier of the Month Award for Parker

DETROIT, MICH.—The Parker Rust Proof Company, pioneer manufacturer of surface treatments for metals, was named "Supplier of the Month" by the Home Laundry Department of General Electric Company in a ceremony at Louisville April 20.

The award and citation were presented by R. J. Keyser, Manager of Manufacturing of the Home Laundry Department of General Electric Company, to R. W. Englehart, President of Parker Rust Proof Company.

Basis of the award, according to the citation, was the performance of Cold Bonderite, installed in the finishing system on recommendation of Parker engineers. The material substitution in three phosphate units resulted in a considerable savings per year in steam costs and has also lowered the ambient temperatures of the paint enclosures in a very positive way. This material, an exclusive product developed by Parker Rust Proof Company, was installed without additional cost in materials, investment or labor.

Everybody's enthusiastic about Cold Bonderite! Since its introduction a year and a half ago, over one hundred plants have installed this revolutionary new system. Cold Bonderite System solutions operate at temperatures 40° to 75° below temperatures in conventional systems, saving important sums in heat costs, maintenance and equipment.

Cold Bonderite can be a winner in your spray finishing line, too! Call in the Parker man right now.

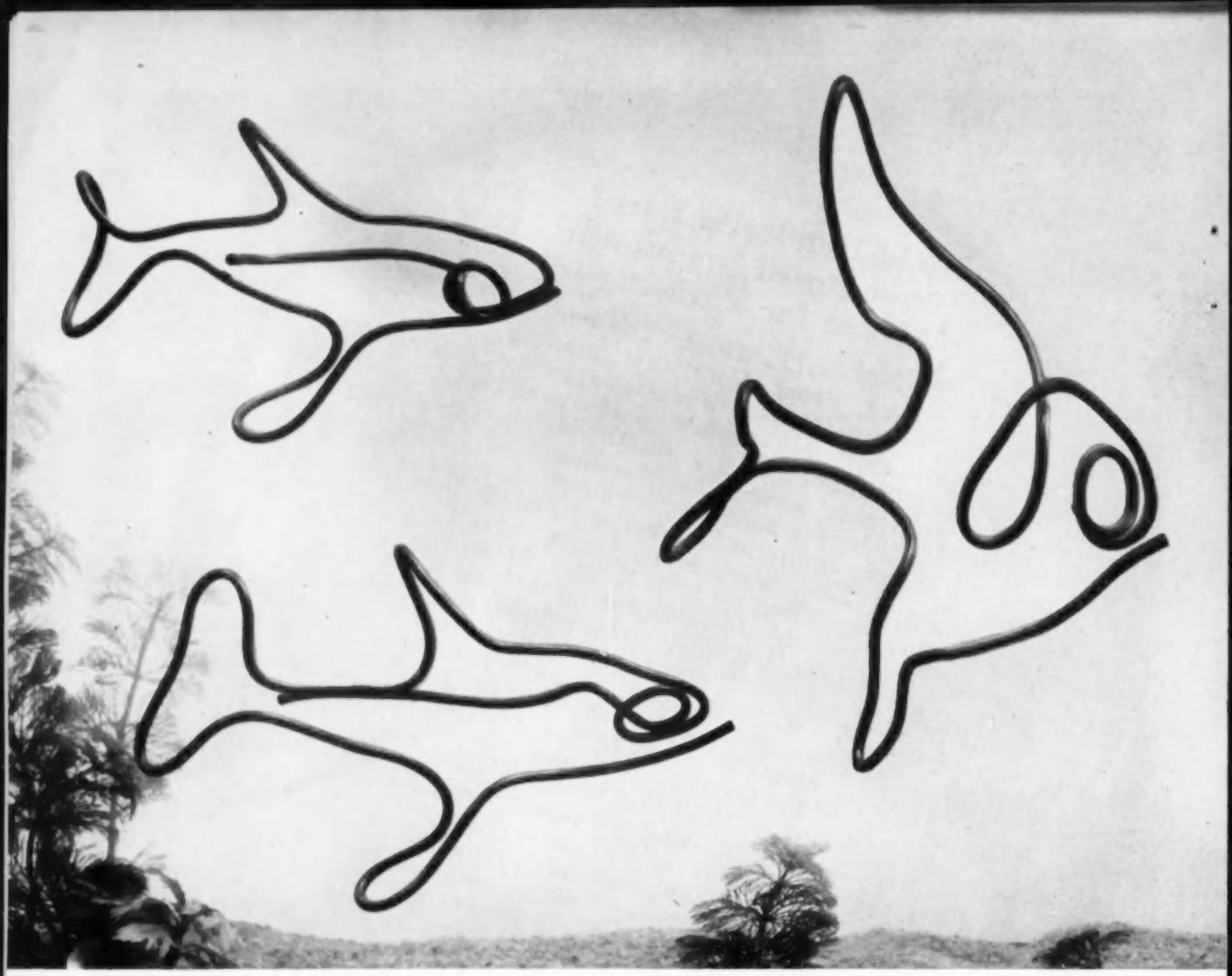
Since 1914—leader in the field

Parker Rust Proof Company

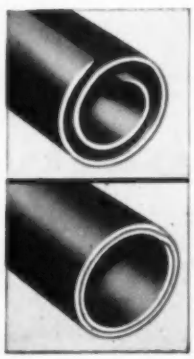
2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE corrosion resistant paint base	BONDERITE and BONDERLUBE aids in cold forming of metals	PARCO COMPOUND rust resistant	PARCO LUBRITE—wear resistant for friction surfaces	TROPICAL—heavy duty maintenance paints since 1883

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.



There's almost no limit to the things Bundy can mass-fabricate



Bundyweld is the only tubing double-walled from a single copper-plated *steel* strip, metallurgically bonded through 360° of wall contact for amazing strength, versatility.

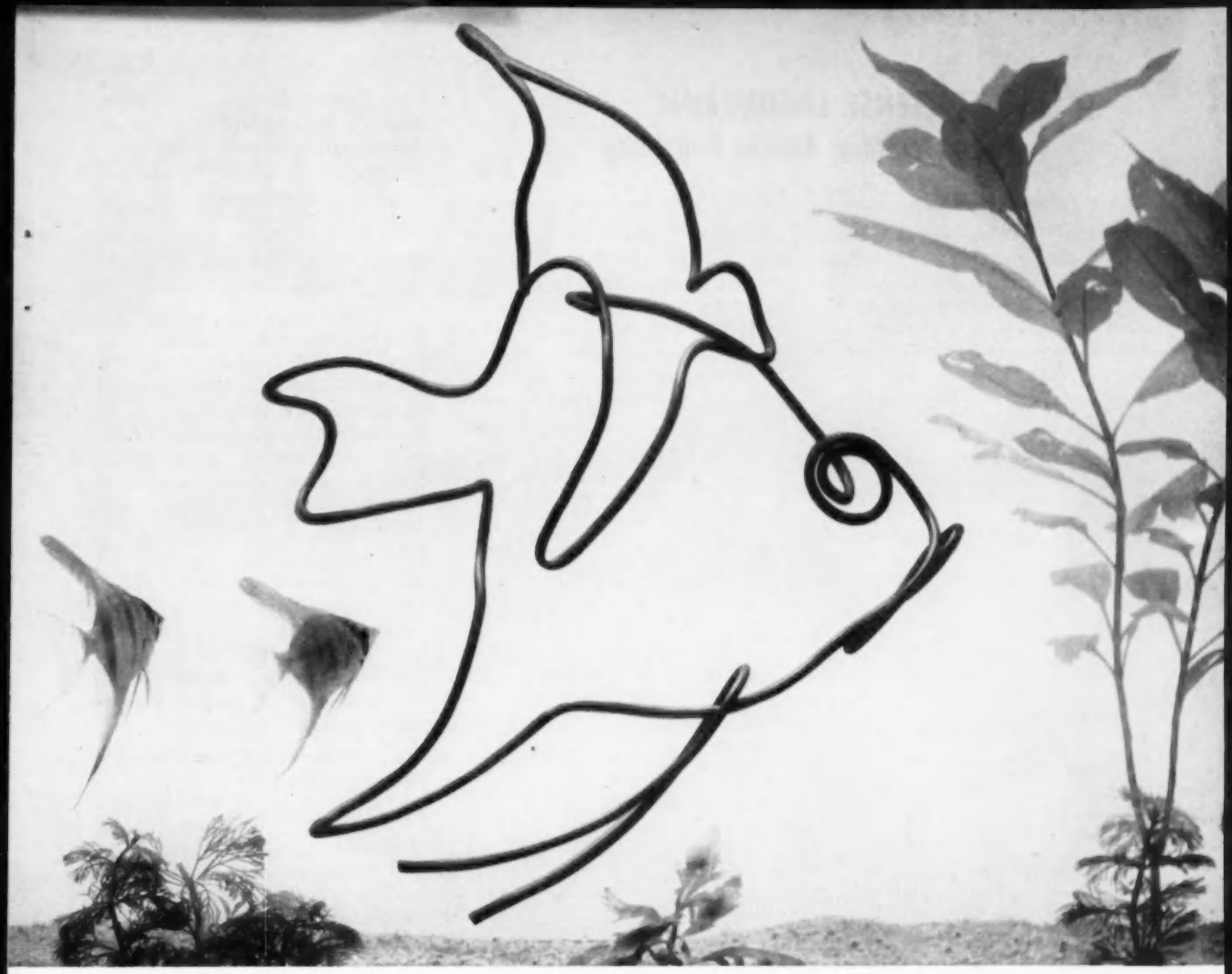
Bundyweld is lightweight, uniformly smooth, easily fabricated. It's remarkably resistant to vibration fatigue; has unusually high bursting strength. Sizes up to ⅝" O.D.

With Bundyweld® we can mass-fabricate shapes to almost any specification. For example, take the coil for a power-steering pump oil cooler shown at right.

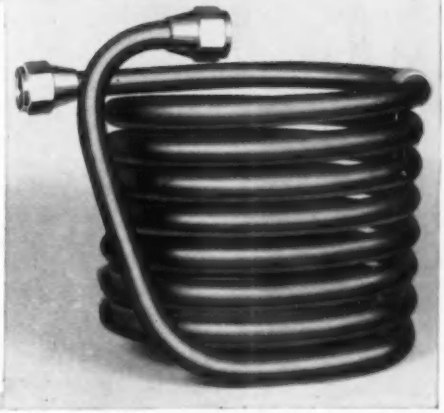
This was the problem: cool the oil for a heavy-duty hydraulic-power-steering pump; do it in a limited space. Bundy engineers found the answer: surround the hydraulic reservoir with a 4¾" high coil of Bundyweld tubing. The hydraulic fluid cools 25°-35°F. as it is pumped through more than 11 feet of tubing.

Tough fabrication jobs like this look easy with highly versatile Bundyweld tubing. Bundyweld is the original steel tubing ***double-walled from a single steel strip.*** Its high bursting strength and resistance to vibration fatigue has made it the safety standard of the automotive industry.

It will pay *you* to use Bundy's complete tubing service: free design assistance, mass-fabrication at minimum cost, ***Bundyweld*** tubing. Bundyweld and Bundy specialty tubings are sold through distributors in principal cities. Call us today!



This heavy-duty oil-cooler coil for a power-steering unit stands only 4¾″ high, yet contains over 11 feet of ½″ x .035″ Bundyweld tubing. Ends are double-flared with fittings attached. The inside diameter measures 4.88″ and is held to +⅛″ tolerance.



There's no real substitute for

BUNDYWELD® TUBING

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, BRAZIL, ENGLAND, FRANCE, GERMANY, AND ITALY

BUNDY TUBING COMPANY • DETROIT 14, MICH. • WINCHESTER, KY. • HOMETOWN, PA.

Circle 183 on Inquiry Card, for more data

DEFENSE ENGINEERING
Plans Military Vehicle Reliability

(*Continued from page 71*)

cases the highly developed system will be supplemented by an old-style manual system. This is perhaps a proper choice in certain cases. However, if the old-style system will meet system requirements perhaps two old-style systems should be used. Another alternative to consider would be to make redundant only the elements of the highly developed systems whose life was questionable to any reasonable degree. The point to be made is that decisions regarding redundancy should be made on the basis of reliability data rather than in intuition. Otherwise cost, complexity, maintenance, and even performance can be quite adversely affected.

Conclusions

From the preceding discussion certain conclusions may be drawn regarding field data and reliability:

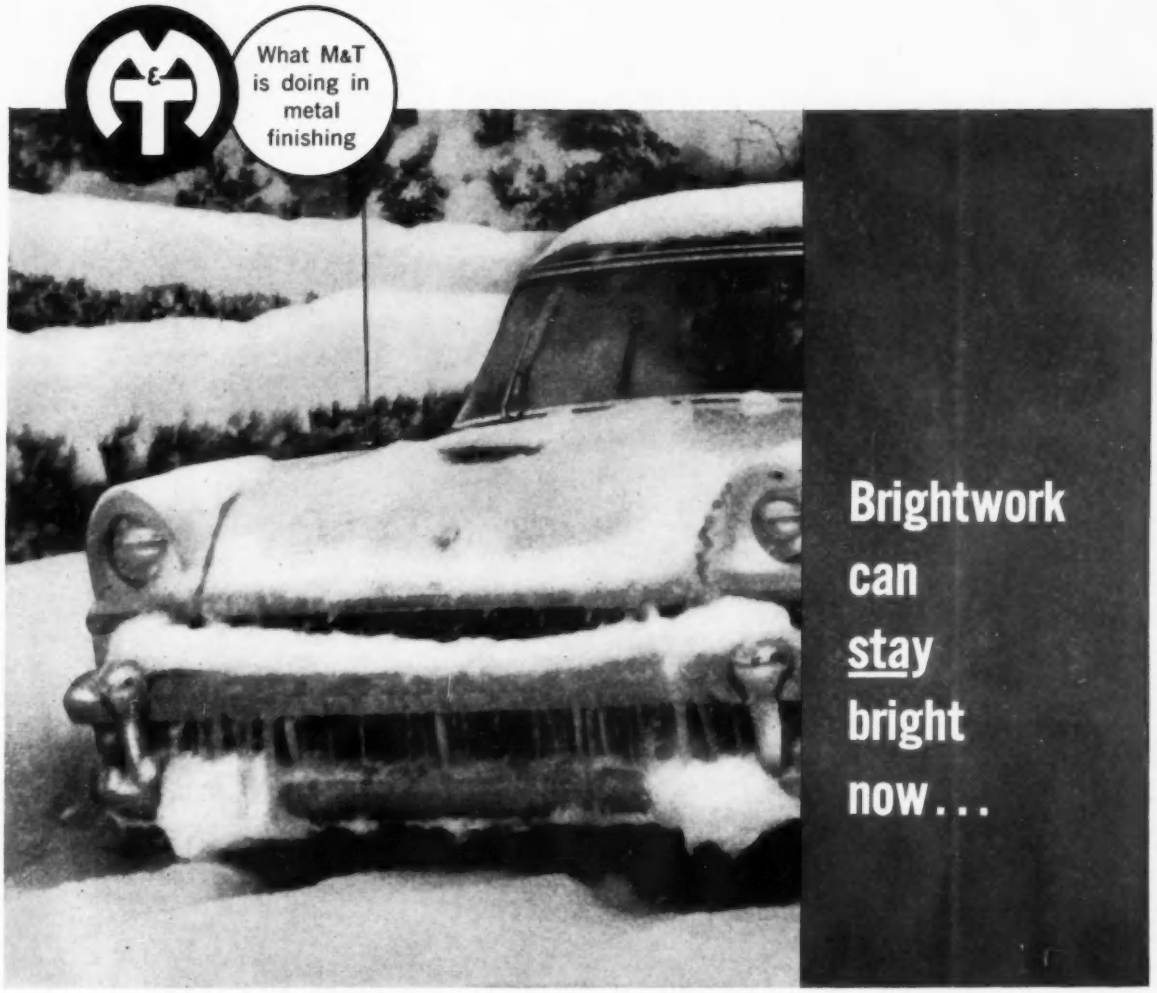
1. The agency responsible for vehicle engineering requires a direct channel to the field in both the United States and overseas theatres of operations if field data is to be acquired with the speed, accuracy, and detail needed. A necessary corollary is the top level support of Ordnance and CONARC commanders.

2. Field engineering representatives must be engineering analysts thoroughly familiar with their product. Their ability, integrity, and personality must be such as to merit the complete confidence and cooperation of all levels of personnel with whom they work.

3. Personnel and procedures for handling field data must provide rapid and accurate interpretation of these data. The objective of greater end-product reliability is realized only if the responsible engineering agency has sound data from the field that can be used as a basis for engineering action.

4. Over-all reliability of a vehicle is a function of the number of parts it contains, the reliability of each part, and the extent to which redundancy is utilized. Redundancy, however, involves certain penalties in cost, maintenance, etc.

5. Adequate field data properly utilized not only upgrades the reliability of present vehicles but also improves significantly the reliability inherent within the design of new vehicles. ■



New M&T Chromium Plating Discovery offers most economical way to improve durability

Durability of chromium plated parts in severe, accelerated corrosion tests has been increased up to 500% by the revolutionary Unichrome "Duplex Chromium" Plating Process developed by Metal & Thermit.

Using M&T "Duplex Chromium" to increase the thickness of chromium approximately five times from the usual average of 10 millionths of an inch enables parts to maintain an ASTM durability rating of 8 or better (10 is *perfect*)! This thicker and more uniform chromium plate radically increases survival time in modern accelerated tests by many times over.

M&T "Duplex Chromium" consists of a layer of Unichrome Crack-Free Chromium which blocks infiltration of corrosives to underlying metal. It is followed by another layer of Unichrome SRHS* Chromium to build up proper thickness. The additional millionths of an inch more chromium, in these two layers, do more for outdoor durability than any other change in present plating procedure. Results show that per dollar invested in equipment and solutions, this new technique gives greater benefits than a corresponding expenditure for thicker copper and nickel undercoats. It saves on capital investment because existing production equipment can be used. It saves by cutting rejects of parts which are now required to survive more rigorous life tests than heretofore.

Simply by adding the few additional minutes to plating time and using M&T "Duplex Chromium", you can add *years* to the life of chromium plated finishes in outdoor exposure. Send for data. Or ask the M&T Man about it.

METAL & THERMIT
CORPORATION
GENERAL OFFICES: RAHWAY, NEW JERSEY

Circle 185 on Inquiry Card, for more data

World-Wide Markets

(*Continued from page* 138)

uted greatly to the work of the various subcommittees of Y14, thanks to the efforts of such men as C. M. Wright of the Chrysler Corporation, James Boxall of the Ford Motor Company, Wayne Stone of Avco Manufacturing Corp., J. Stanndard of United Aircraft Corp. and Mr. Trowbridge.

These uniform drafting practices are being considered by ABC Conference on Unification of Engineering Standards, with the objective of eventually having uniform drafting practices through all English speaking nations.

There are a number of ASA Sectional Committees on which representatives of the automotive industries are very active—among them the committees concerned with small tools, surface finish, washers and other small components, and nuclear energy.

Two American standards in the automobile field developed by sectional committee methods have found particularly wide application. One is the "American Standard Safety Code for Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways" and the other is "American Standard Inspection Requirements for Motor Vehicles." The windshield of every automobile on U. S. roads is marked with the words "American Standard" or the letters "AS," indicating that the glass is made in accordance with the American Standard safety requirements.

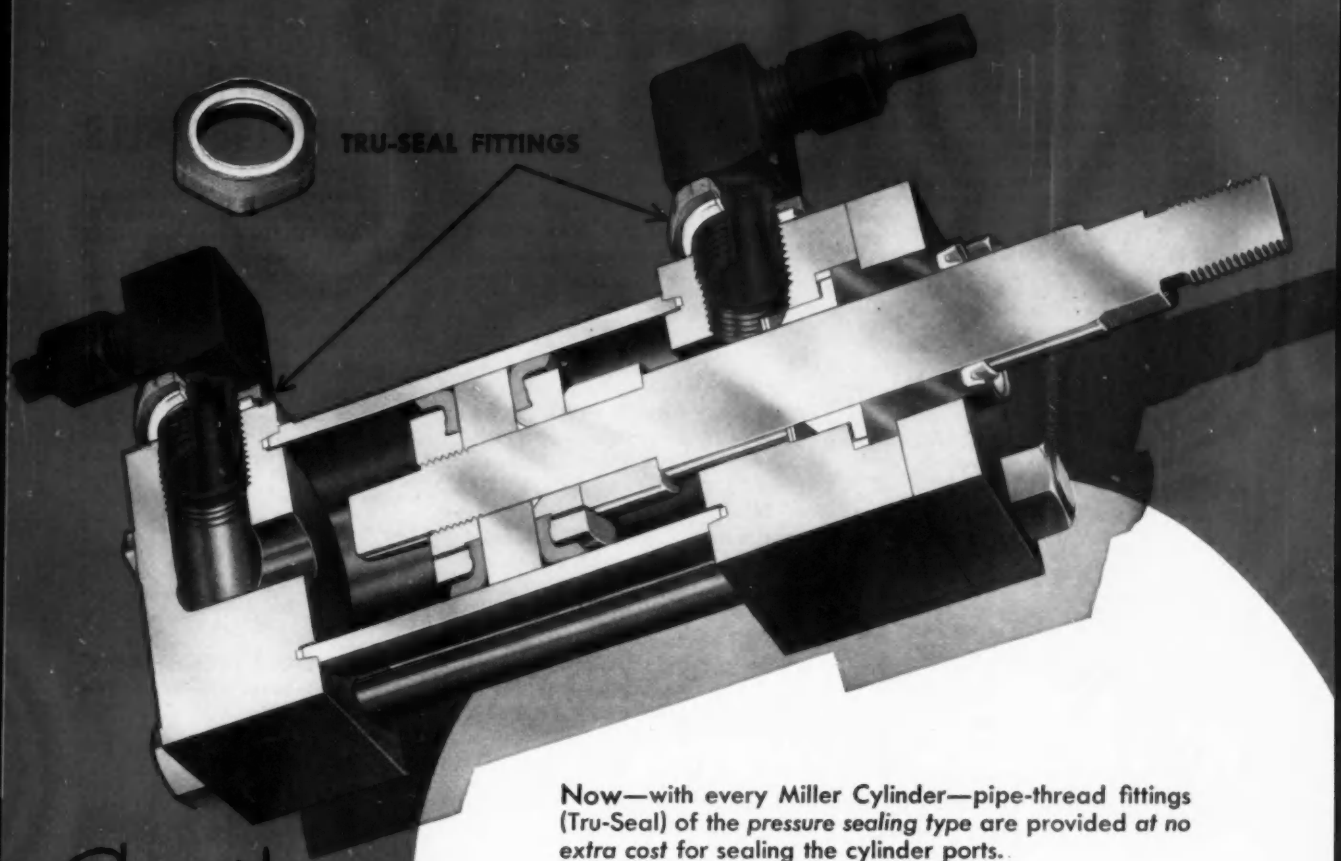
The American Standard inspection requirements provide performance standards and methods of testing for the safe operation of motor vehicle parts—brakes, steering gear, lights, frames, wheels, tires, etc.

International Work

Whenever the American automotives industries participate in international standards work of the International Organization for Standardization (ISO), or in the International Electrotechnical Commission (IEC), their delegates

NOW...even the PORTS have seals of the PRESSURE SEALING TYPE!

(J.I.C. Standard H6.2.2)

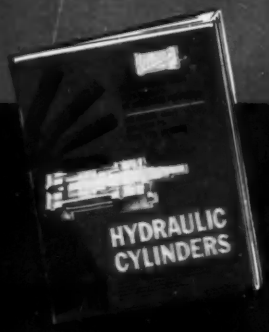


Now—with every Miller Cylinder—pipe-thread fittings (Tru-Seal) of the *pressure sealing type* are provided *at no extra cost* for sealing the cylinder ports.

Additional advantages of these fittings are:

1. All circuit piping and fittings can be easily positioned.
2. Damage to equipment caused by high tightening torque is completely eliminated (especially on valves, pumps, etc.)
3. Sealing material is Teflon, which is compatible with all hydraulic fluids (J. I. C. Standard H6.2.1)

Specify Miller For Greater Reliability



Engineering Bulletins on Miller Air and Hydraulic Cylinders Available on Request

MILLER FLUID POWER

DIVISION OF FLICK-REEDY CORPORATION

7N024 York Road, Bensenville, Illinois

AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS

are accredited by ASA, which represents U. S. interests in the work of these two organizations.

An ISO project of particular significance to the automobile industry is that of ISO Technical Committee 22, which is concerned with the establishment of uniform lighting requirements for head lamps, signal lights, tail lights, stop lamps, etc.

The most recent meeting of this committee was held in Belgium, June 12. The U. S. was represented by Ralph H. Bertsch, General Motors Truck and Coach Division. The committee has drawn up a "draft recommendation" for international standard lighting requirements, and this document is presently being circulated among the 18 member countries on the committee. This draft is the product of ten years of work by member representatives.

By participating in international standards work, the American automobile industry assures that its interests are considered. Requirements in other countries that differ from American practices can make costly modifications necessary if American manufacturers want to sell in those markets. On the other hand, if vital differences are eliminated through agreements secured by international standards, a truly world-wide market for automobiles can be established, unnecessary costs can be avoided, and everybody will benefit. ■

Westinghouse Contract

Air Arm Div. of Westinghouse Electric Corp. received a multimillion contract from North American Aviation, Inc., to develop an electronic defensive system for the B-70 Valkyrie bomber.

The new B-70 has a cruising speed of 2000 mph, can fly faster than a high-velocity rifle bullet. The plane's defensive system will make use of electromagnetic and other techniques to confuse an enemy.

Tough jobs call for the right equipment . . .

EVANS HEATERS

are right for trucks because they are built for trucks!

A passenger car heater is fine for an automobile, but it's as out of place in a commercial vehicle as a convertible would be in the scene below. To heat your truck *properly*, a *truck-built* heater is a must!

Whatever your truck heating requirements—whether for a conventional truck or an extra-heavy-duty giant—there's an Evans heater custom-tailored to your needs. Evans heaters are designed to provide both the correct BTU output *and proper heat distribution* for the truck in which they are installed. What's more, they give you the rugged dependability and durability you need . . . the high truck-heating performance you want.

If you have a particular truck heating problem, an Evans heating engineer will be glad to call and help you work it out. For complete information, write Evans Products Company, Dept. P-7, Plymouth, Michigan.

Proved in the field, Evans truck-built heaters offer the utmost in heating comfort and efficiency—even when temperatures drop below zero for extended periods.

Regional Representatives: Cleveland, Frank A. Chase • Chicago, R. A. Lennox Detroit, Chas. F. Murray Sales Co. • Allentown, Pa., P. R. Weidner

EVANS TRUCK AND BUS HEATERS AND VENTILATING SYSTEMS

EVANS PRODUCTS COMPANY • PLYMOUTH, MICHIGAN

PHOTO BY KARSH OF OTTAWA

"Supplier reliability is a must to sound product development"

—R. W. SWANK, Research and Development, Smith-Erie Div., A. O. Smith Corp.

"We count Sharon Steel as one of our most dependable suppliers, and this is extremely important to a development engineer," says R. W. Swank, Manager of Research and Development of service station pumps in the Smith-Erie Division of A. O. Smith Corp.

Shown here with P. R. Fishburn, Manager of Manufacturing, Swank points out "If we can design with the knowledge that we need not be concerned about material analysis variation, our jobs are made that much easier. We've found we can expect this kind of supplier reliability from the *Sharon Steel Corporation, Sharon, Pa.*"

SHARONSTEEL **SHARON** *Quality* **STEEL**

Circle 191 on Inquiry Card, for more data

ZENITH EXPERIENCE WITH CARBURETORS PAYS OFF IN ANY FIELD

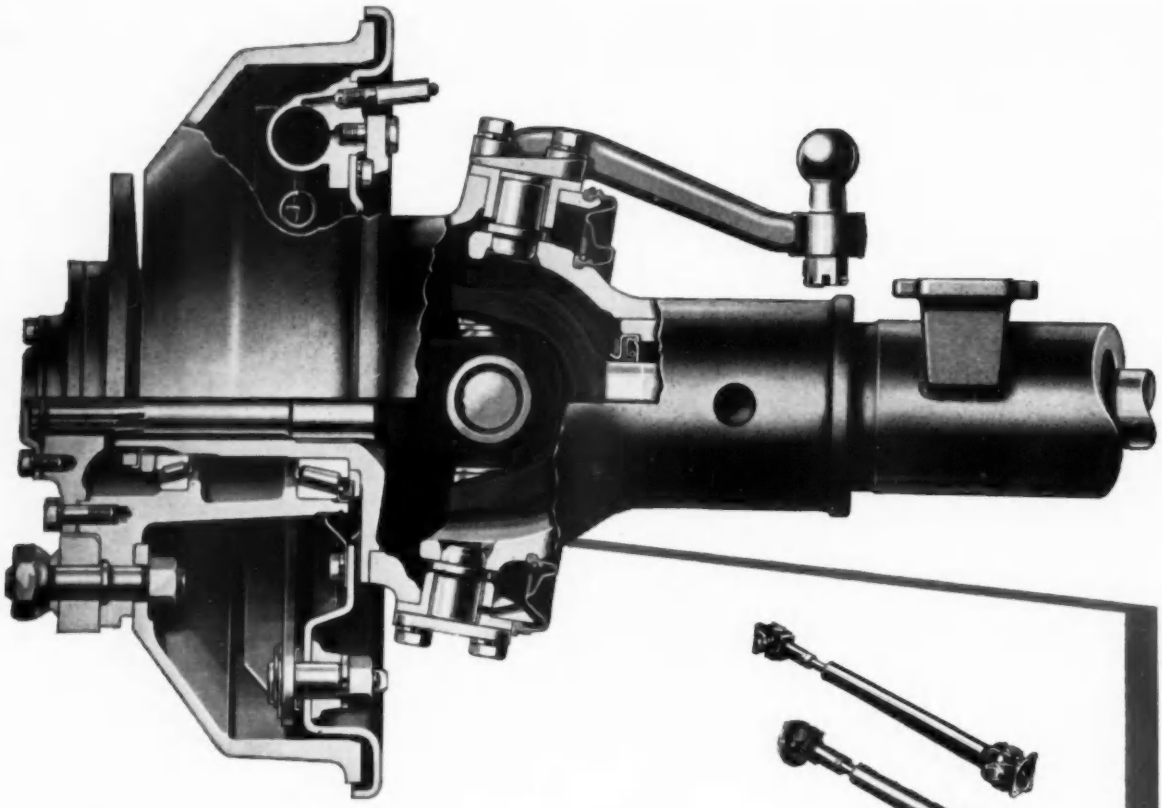
If you are interested in engine performance, you'll be interested in what Zenith® experience can do for you. Trucks . . . buses . . . tractors . . . industrial engines . . . boats . . . off-the-road vehicles—the record shows Zenith has more experience in designing and building carburetors in more different fields than any manufacturer you can name!

Because Zenith can call upon so much experience with more types of engines, the above firms know they are in good hands when they specify Zenith Carburetors. As you, too, will discover: *Zenith experience provides important extra benefits.* For detailed information, write Zenith Carburetor Division, 696 Hart Avenue, Detroit 14, Michigan.

Zenith Carburetor Division
DETROIT 14, MICHIGAN

Bendix
AVIATION CORPORATION

Circle 196 on Inquiry Card, for more data



STANDARD PROPELLER SHAFT ASSEMBLIES

For a better front-driving axle, get this Timken-Detroit FDS-750

equipped with

BLOOD BROTHERS Universal Joints

Here's another example of Blood Brothers' engineering cooperation . . . to produce ever-better truck components.

When this major axle source wanted an improved front-driving unit for a truck-building customer, their engineers and ours got together. The result shown above now provides users of famous brand trucks with *substantially increased capacity* on their front-driving axles.

Greater strength, better performance and lower costs may result for your products too—through a cooperative effort with Blood Brothers.

Just write or call—we'll arrange to meet at your convenience.
For a quick review of our products, request Bulletin 557.

SINGLE AND DOUBLE JOINTS FOR POWER TAKE-OFF USE

CLOSE-COUPLED JOINTS AND ASSEMBLIES

ROCKWELL-STANDARD CORPORATION

Blood Brothers Universal Joints

ALLEGAN, MICHIGAN

UNIVERSAL JOINTS AND DRIVE LINE ASSEMBLIES

Circle 193 on Inquiry Card, for more data

Aetna

A reliable source for precision parts

Precision parts production for Original Equipment Manufacturers has been an important activity at AETNA for almost half a century.

The same precision manufacturing equipment and complete heat treating facilities which produce the exceedingly fine tolerances and accurate finishes required in anti-friction bearings have likewise been employed in the production of a wide variety of other precision parts. Manufacturers quickly learned that they could depend upon AETNA not only to produce these parts but to meet their delivery schedules as specified, and usually at a lower cost than they could be fabricated in their own plants.

These are the facilities for precision parts production that AETNA has available:

Complete, stream-lined equipment for fabricating regular and stainless steel, cast-iron, bronze, brass and Monel Metal in all forms—flats, tubing, forgings, castings, coil strip, coil wire and screw machine bar stock.

Punch press operations to 415 tons pressure-capacity.

Turning, boring and face machining operations to 38" O.D.

Heat-treating, hardening, quenching or chilling treatment.

O.D. bore, face and race grinding to 36" O.D.

Metallurgical laboratory analysis, tensile and compression testing.

Plating or black oxide surface conditioning.

Tolerances to standard, precision, or super-precision limits.

Ground, lapped or honed finishes.

Inspection Equipment: Rockwell Hardness Tester; Comparator, Optical Flat and Magnaflux Tests.

Call your local AETNA representative listed in the yellow pages of your Classified Telephone Book, or write direct.

DATA REQUIRED: blueprint, dimensional specifications; special characteristics; load, speed and life requirements, if applicable; quantity requirements; deliveries in terms of estimated initial, monthly and annual production usage.

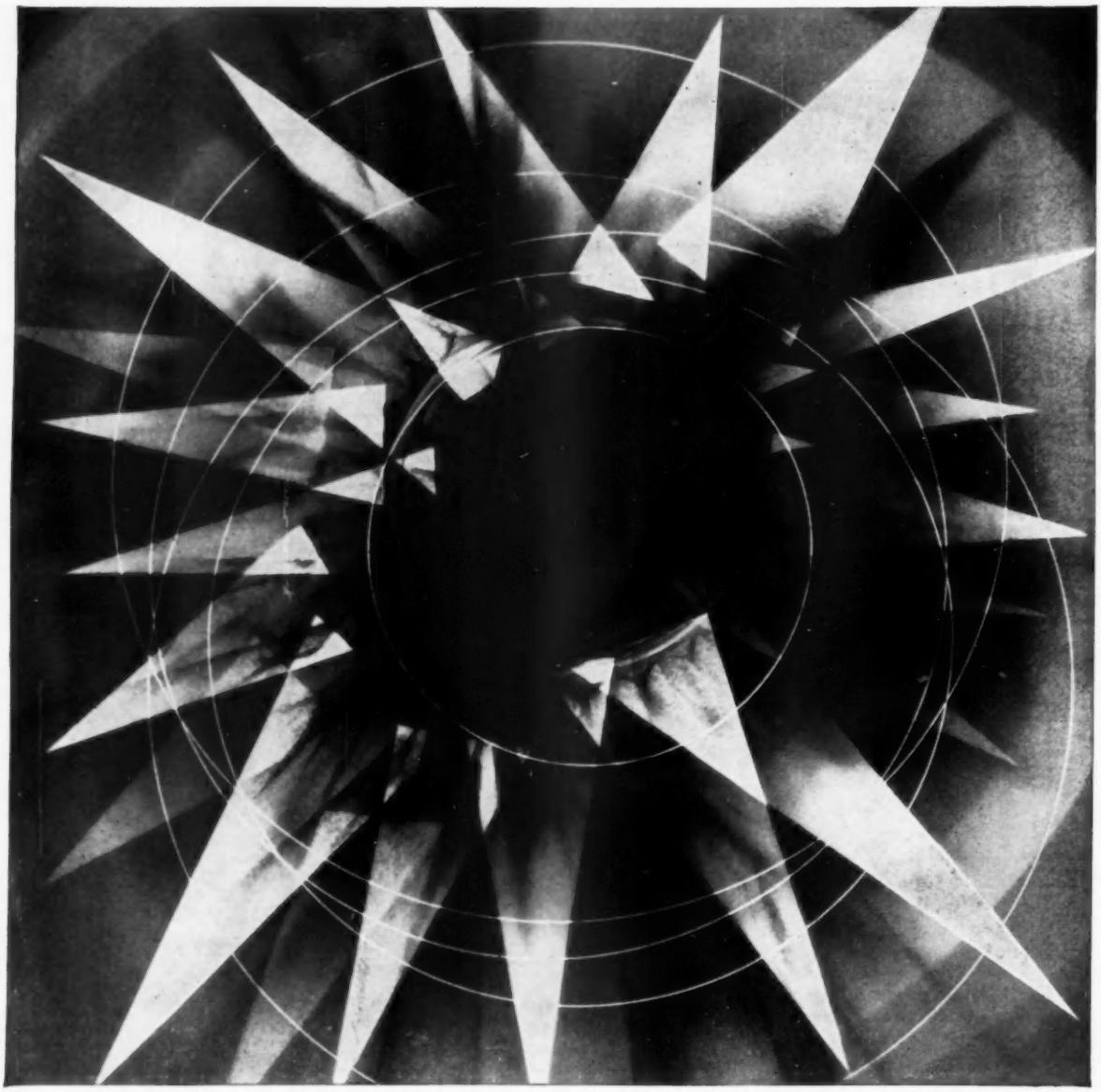
AETNA BALL AND ROLLER BEARING COMPANY

Aetna

DIVISION OF PARKERSBURG-AETNA CORPORATION • 4600 SCHUBERT AVE. • CHICAGO 39, ILL.

In Detroit: SAM T. KELLER, 1212 Fisher Bldg.

ANTI-FRICTION SUPPLIERS TO LEADING ORIGINAL EQUIPMENT MANUFACTURERS SINCE 1916



breaking the barriers
with Vacuum Induction Metals

Today's challenge lies in developing metals and means of cracking the thermal barrier.

The metals problem has already been partially solved by superalloys produced through Vacuum Induction Melting. This process, as developed by Kelsey-Hayes, has yielded such super refractory alloys as Udimet 500, 600 and 700—clean, pure alloys combining unsurpassed stress-rupture life with superior high tensile strength above the 1500°F range.

In addition to making new superalloys, Kelsey-Hayes upgrades existing alloys through vacuum induction melting.
Kelsey-Hayes Co., Detroit 32, Michigan.

Vacuum Induction Melting Develops

- *High temperature corrosion resistance*
- *Increased ductility*
- *Extreme cleanliness*
- *Precise chemical control*
- *Longer stress-rupture life*
- *Increased tensile strength*
- *Better fatigue resistance*
- *Greater yield strength*
- *Greater impact resistance*
- *Greater creep properties*

KELSEY-HAYES

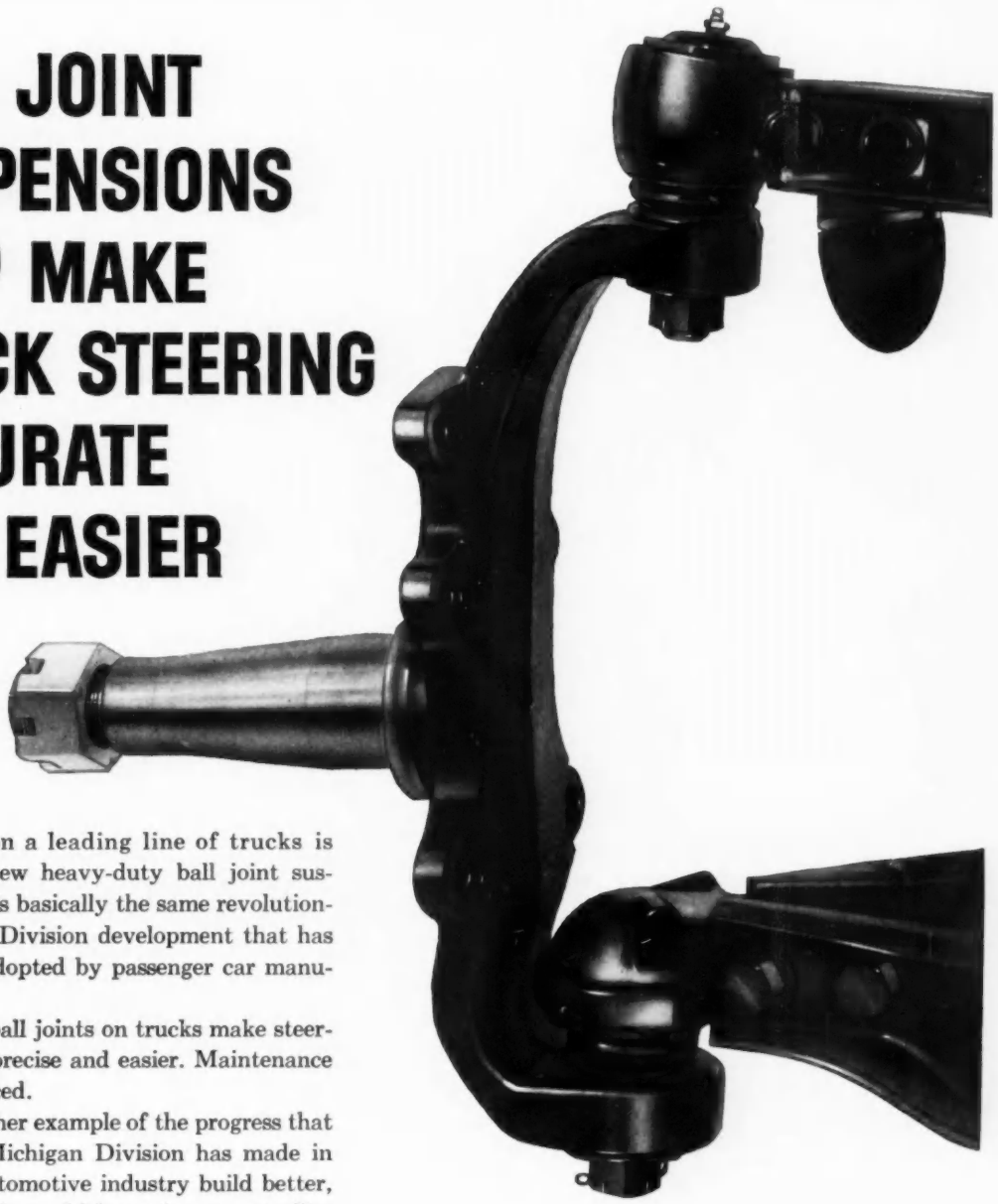
Automotive, Aviation and Agricultural Parts • Hand Tools for Industry and Home

18 PLANTS: Detroit and Jackson, Michigan; Los Angeles; Philadelphia and McKeesport, Pennsylvania; Springfield, Ohio; New Hartford and Utica, New York; Davenport, Iowa; Windsor, Ontario, Canada.

Circle 195 on Inquiry Card. for more data

New from THOMPSON'S Michigan Division

BALL JOINT SUSPENSIONS HELP MAKE TRUCK STEERING ACCURATE AND EASIER



Now in use on a leading line of trucks is Thompson's new heavy-duty ball joint suspension. This is basically the same revolutionary Michigan Division development that has been widely adopted by passenger car manufacturers.

Thompson ball joints on trucks make steering accurate, precise and easier. Maintenance costs are reduced.

Here is another example of the progress that Thompson's Michigan Division has made in helping the automotive industry build better, customer-pleasing vehicles at lower costs. For complete details, call JEfferson 9-5500, or write us at 34201 Van Dyke, Warren, Mich.

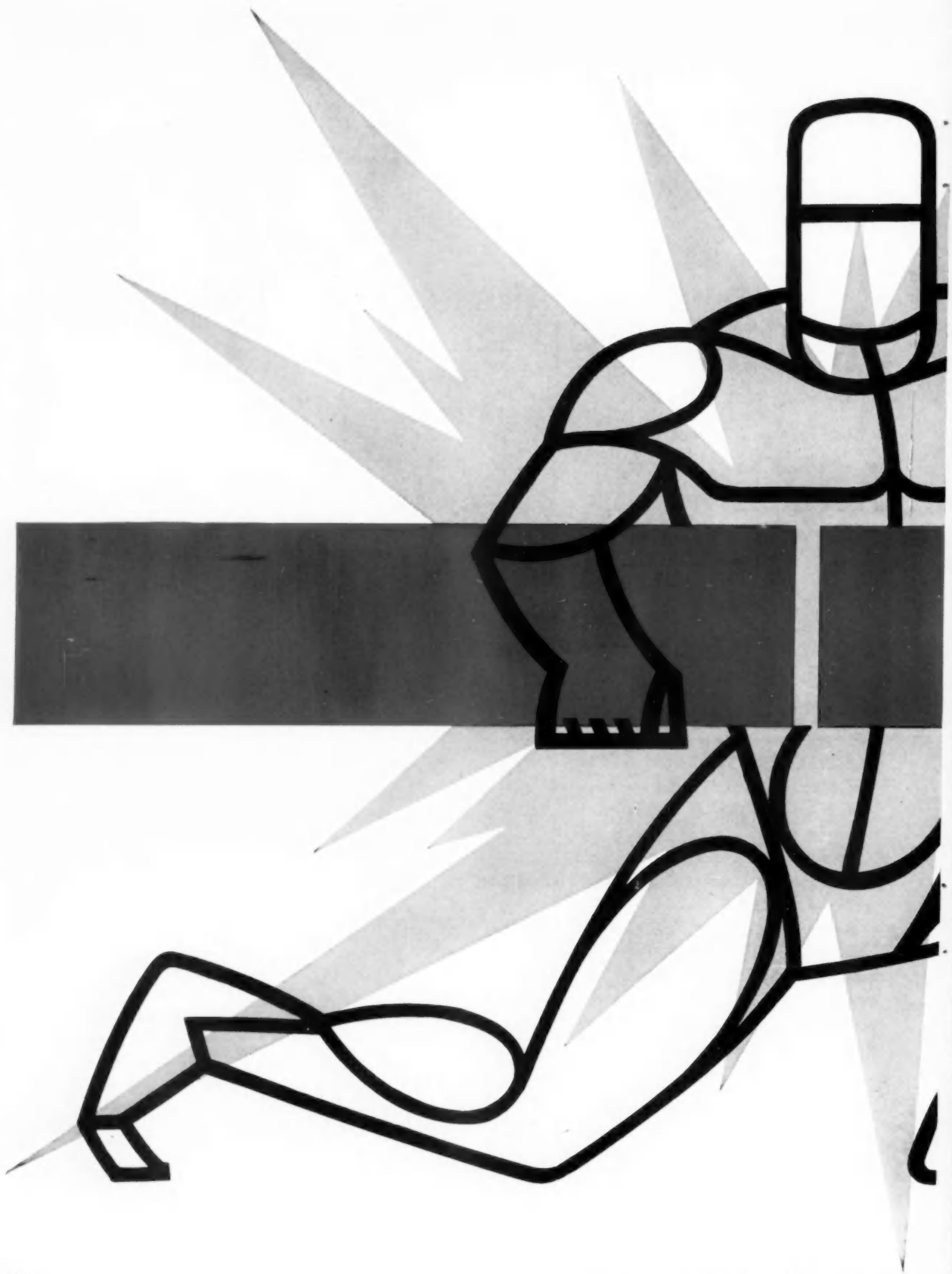
AUTOMOTIVE GROUP

THOMPSON PRODUCTS MICHIGAN DIVISION

Thompson Ramo Wooldridge Inc. • 34201 Van Dyke Ave. Warren, Michigan

THOMPSON PRODUCTS LIGHT METALS DIVISION | THOMPSON PRODUCTS MICHIGAN DIVISION | THOMPSON PRODUCTS VALVE DIVISION | THOMPSON PRODUCTS RAMCO DIVISION | THOMPSON PRODUCTS MOTOR EQUIPMENT MANUFACTURING DIVISION

Circle 192 on Inquiry Card, for more data



COMBINES SUPERB WELDABILITY WITH EXTRA STRENGTH

N-A-XTRA

BEST LOW-ALLOY EXTRA-STRENGTH STEEL YOU CAN BUY

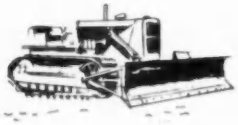
When only the strongest steels will do, specify N-A-XTRA HIGH-STRENGTH. This low-alloy heat-treated steel is now available in minimum yield strengths ranging from 80,000-110,000 psi.

Along with this great strength, N-A-XTRA is readily formed and fabricated. It can be welded by any process. The most drastic welding tests on N-A-XTRA have shown no underbead cracking, even when plate temperatures are as low as —60°F.

Because N-A-XTRA is nearly three times stronger than mild carbon steels, it gives designers an opportunity to eliminate useless dead weight from finished products and realize substantial savings. Let us show you how N-A-XTRA HIGH-STRENGTH steel can do a job for you. Write Great Lakes Steel Corporation, Detroit 29, Michigan, Dept. J-7.

GREAT LAKES STEEL

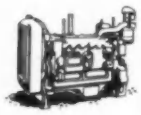
A DIVISION OF NATIONAL STEEL CORPORATION

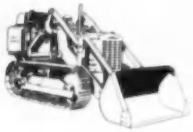


Challenging Engineering Opportunities at CATERPILLAR

be a part of the company building the world's most complete line of earthmoving equipment

Find the satisfaction of *growth* and *stability* within a *growth* company – where imaginative men are creating products for highway construction – industry – farms – national defense – products which build a better world. Caterpillar offers top ranking Research and Development opportunities – stimulating assignments – professional and personal advancement. You'll associate with the leaders and pioneers in this field – and have at your command the finest equipment, laboratories and development facilities. Please write us, telling all about yourself. Inquiries are confidential, of course.





(Below – New Caterpillar Technical Center presently under construction)

responsible positions available in
RESEARCH — DESIGN DEVELOPMENT

GAS TURBINE LABORATORY
Design, ignition, fuel and combustion systems, etc.

ENGINE DEVELOPMENT LABORATORY
Fuel injection, turbocharged engines, combustion, etc.

VEHICLE COMPONENTS LABORATORY
New power shift transmissions, transmissions, controls, clutches, final drives.

VEHICLE DEVELOPMENT LABORATORY
Quantitative and comparative performance evaluation, soil mechanics, full scale load analysis.

PRODUCT AND APPLICATION ENGINEERING DESIGN
Engines, systems, fuel injection, tractor, transmission, vehicle configuration, earthmoving machinery.

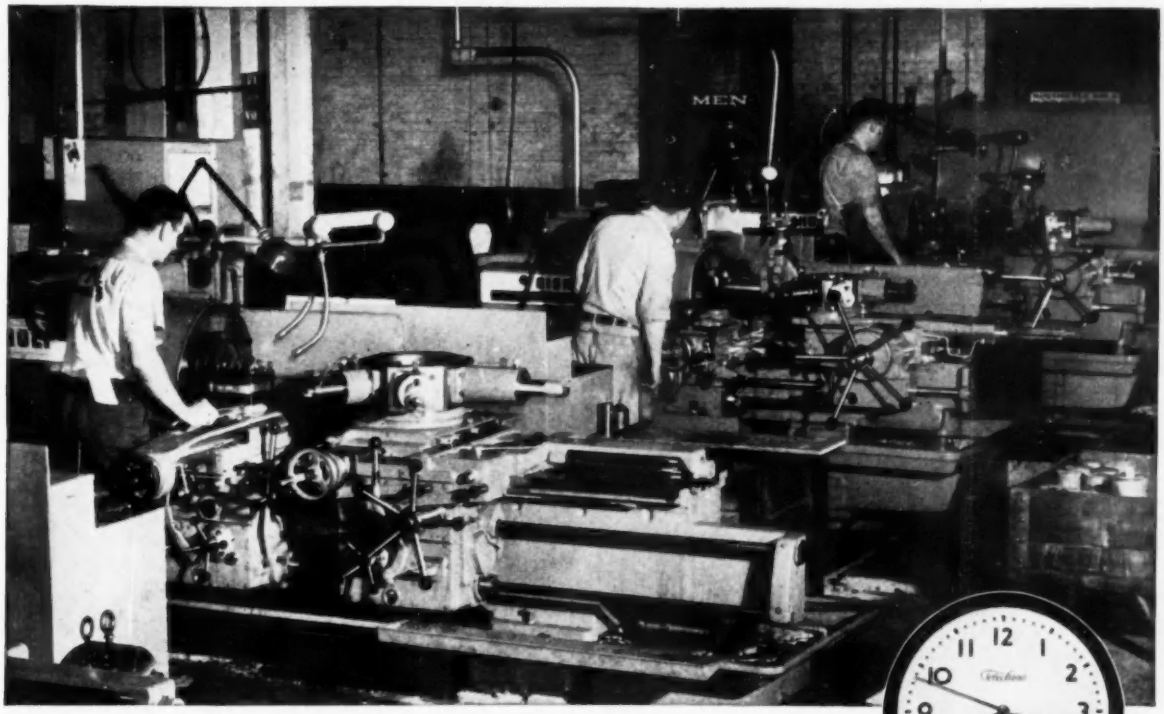
SEND RESUMÉS TO:

John A. Myers – AI-79

Professional and Technical Employment

CATERPILLAR TRACTOR CO.

PEORIA, ILLINOIS



Are you getting your 19 minutes?

Recent studies prove the average manufacturer operates at a profit *only during the last 19 minutes of every working day.*

What happens to the rest of the day's output? According to the National Association of Manufacturers, it goes to pay the costs of doing business.

Think what this means to manufacturers attempting to produce profitably with obsolete equipment... with machining unavoidably representing a large part of the manufacturing cost.

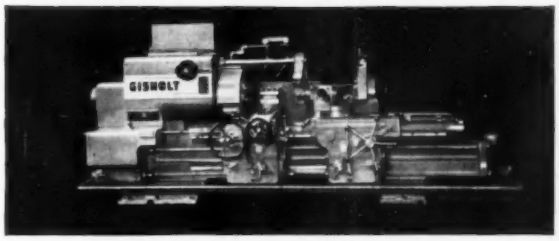
The thin line between profit and loss in your operation can well hinge on your taking advantage of modern, high-speed machine tools with ample power, reserve feeds and speeds, and maximum flexibility.

If you have obsolete equipment in your shop, now is the time to look at it closely and critically. The difference between the old and the new may amaze you. Find out now just how much obsolete machines are holding you back.

Why not call in your Gisholt Representative and talk it over with him? He'll give you fair and accurate appraisals of any machine's productive output. Call him today.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW-MACHINE GUARANTEE



Gisholt MASTERLINE
Saddle Type Turret Lathe

Rugged headstock gear train provides 24 different forward speeds—all from a single-speed motor, for full power on all cuts.

Hydraulic speed selector permits effortless speed shifts without stopping spindle or shifting gears.

Here's a rugged, powerful machine that delivers maximum output and accuracy from today's carbide tools—and has ample reserve to meet tomorrow's tooling requirements.

Contact your Gisholt Representative today for full details.

Gisholt Machine Company
Madison 10, Wisconsin

☐ Send Saddle Type Turret Lathe Literature.
☐ Have Gisholt Representative call.

Name.....*Title*.....

Street Address.....

City.....*State*.....

Circle 199 on Inquiry Card, for more data

Geared by FULLER . . .

YELLOW TRANSIT buys more Fuller-equipped KW's

Yellow Transit Freight Lines, Inc., Kansas City, Missouri, recently purchased an additional 40 diesel-powered Kenworth CBE Tractors and now operates 342 Kenworths of the same type, all equipped with Fuller 5-A-65 Heavy-Duty 5-speed Transmissions.

Superintendent of Maintenance Mel McClure says, "We specify Fuller for a number of reasons. The 5-A-65 Transmissions in our Kenworths have given us the best of service. Maintenance costs have been low; parts and service availability along our routes is excellent. Long life, correct gear splits and freedom from downtime really appeal to our drivers and mechanics. For dependability and ease of operation . . . and to help us move more goods, more efficiently . . . Fuller Transmissions are the best."

One of the fastest-growing motor freight carriers in the country, Yellow Transit has more than doubled tonnage and gross revenue since 1955. The Fuller-geared fleet now operates over 17,000 route-miles throughout nine states in the Midwest and Southwest.

For lower operating costs, less downtime for maintenance, reduced driver fatigue and *greater profits*, ask your truck or equipment dealer about the Fuller Transmission best suited for *your* operation.

FULLER

TRANSMISSION DIVISION
MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN
Subsidiary EATON Manufacturing Company

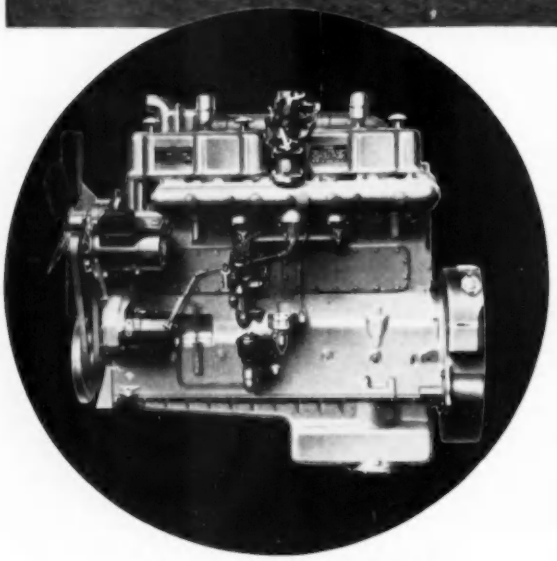
Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla. Automotive Products Company, Ltd., Brock House, Langham Street, London W.1, England, European Representative

Circle 201 on Inquiry Card, for more data

On the milk run

...OR ANY RUN

PETERBILT truck—tire size: 10:00 x 20; rear axle ratio: 5.91; gross vehicle weight: 76,800 lbs.—is powered with Waukesha 145-GZB engine.



Waukesha 145-GZB High Output Gasoline Engine, 5⅜-in. bore x 6-in. stroke, 817 cu. in. displacement, up to 260 hp at 2400 rpm.

where the pay-off is on pay-load

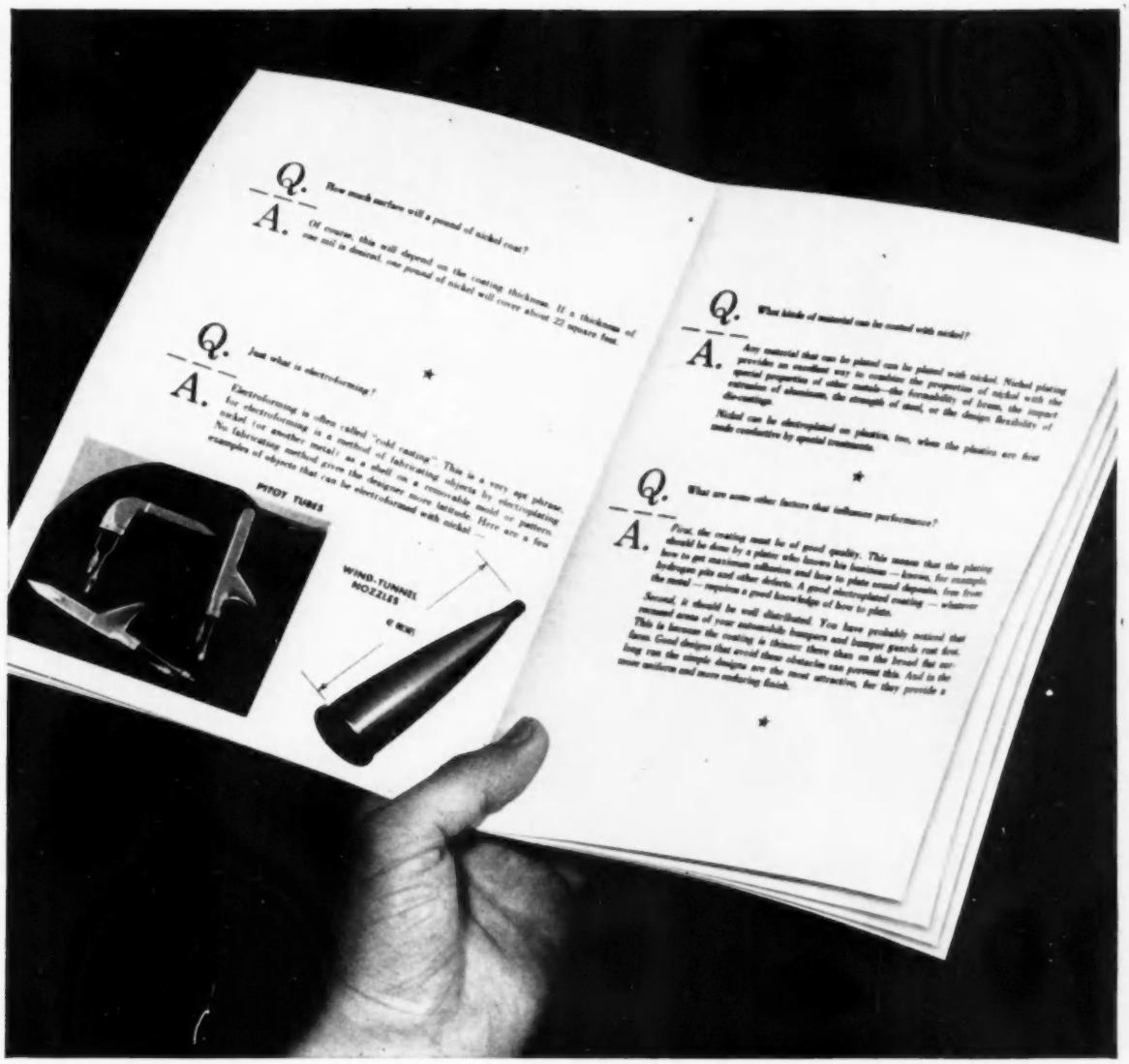
WAUKESHA *transport* ENGINES

Short runs or long hauls—the pay-off is on pay-load that gets there faster. A rare combination of extra power plus extra speed, with rugged reliability—the Waukesha 145-GZB High Output Engine keeps trucks on schedule with day-after-day all-ways-dependable regularity. It's a high compression, overhead valve gasoline engine with interchangeable cylinder heads, removable wet sleeve cylinders, water-heated intake manifold, vibration dampener, heavy-duty aluminum pistons, 7-bearing, 3½-inch crankshaft fully counterbalanced and many other fully-proved features, all detailed in Bulletin 1553.

WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN
New York • Tulsa • Los Angeles
Factories: Waukesha, Wisconsin and Clinton, Iowa

436

Circle 202 on Inquiry Card, for more data



New booklet reveals...

eye-opening facts on Nickel plating

Just leaf through two or three pages and right off you'll realize that this new booklet on Nickel plating fills a long-felt need.

It's not a how-to-do-it manual. Not a technical paper on processes. Not a sales blurb. **It's an idea generator!**

It contains 40 eye-opening facts that cover every important phase of Nickel plating – facts that may give you an entirely fresh viewpoint on this useful process.

For example, it discusses how manufacturers may cut fabrication costs by using sheet, strip—even pipe and tubing—that has been preplated with Nickel...how plated surfaces can be "made-to-order" because Nickel can be plated as thin as a breath or as thick as you would want . . .

What's more, it illustrates many of the parts that can be formed at less cost by electroforming or "cold casting"...how Nickel can be plated even on many non-metals...how more uniform coatings on complicated shapes can often be achieved by the new electroless processes.

Tips on designing for better plating are also packed into this easy-to-read, 24-page booklet. Called "Practical Answers to 40 Practical Questions about Nickel Plating," it's yours for the asking. Just drop us a postcard for your free copy.

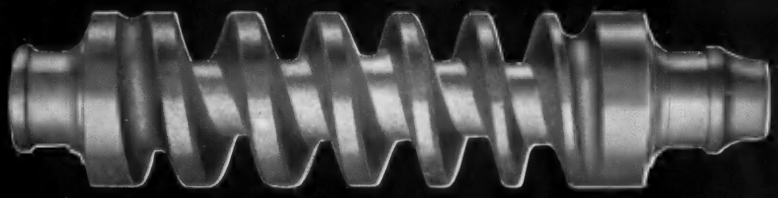
The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

Inco Nickel

makes plating perform better, longer

Circle 203 on Inquiry Card, for more data

VARIABLE* RATIO STEERING



Constant ratio 22:22:22 . . . 22 to 1 ratio for cornering and 22 to 1 for straight-ahead handling . . . 5 turns of wheel from lock to lock.

Variable ratio 12:20:12 . . . 12 to 1 ratio for cornering and 20 to 1 for straight-ahead handling . . . 3 turns of wheel from lock to lock.

*Originated and developed by Ross . . . .

● Today, the big news in steering is *variable ratio* steering.

And with good reason. Variable ratio steering gives *faster* steering and quicker recovery for cornering . . . and *slower* steering and greater stability for straight-ahead handling. Variable ratio is a Ross development.

Steering specialists since 1906, Ross provides the right gear for every steering need—manual or power, constant or variable ratio. Ross invites *your* steering inquiry.

Ross **STEERING**

ROSS GEAR AND TOOL COMPANY, INC. • LAFAYETTE, INDIANA

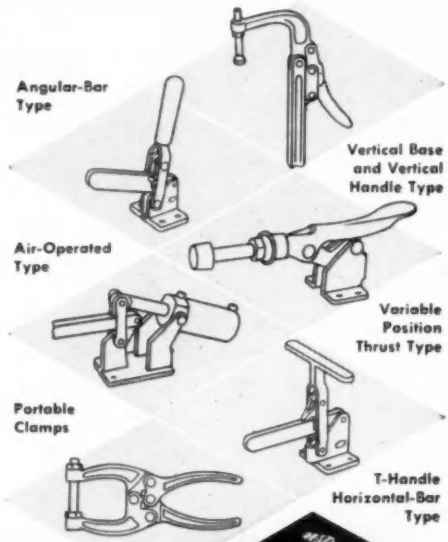
Gemmer Division • Detroit

Where It's Quality, Quality, Quality!
It's Quality DE-STA-CO Toggle Clamps

FINAL INSPECTION OF ROSS OPERATING VALVES subjects every valve to a pressure test far exceeding its normal usage. For over fifteen years, fixtures similar to this, all employing De-Sta-Co No. 620 plunger clamps, have been built to do this critical high pressure sealing job.

Whether your holding and clamping operation is inspection, machining, tapping, grinding, welding, bonding or other assembly, there is a specific De-Sta-Co Toggle Clamp to do it better. Fast action; positive clamping, long life through thousands of production operations have made De-Sta-Co known for almost 30 years as the leading tool in the field. And all of our medium and larger models use hardened serrated pins in hardened bushings staked to prevent wear. A broad selection of spindle accessories increases the versatility of the clamp you specify.

Our representative in your area is qualified and ready to serve you. Send for our catalog showing clamp applications, scale drawings and complete information.



DE-STA-CO

ORIGINATORS OF PRODUCTION CLAMPING

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DETROIT STAMPING COMPANY

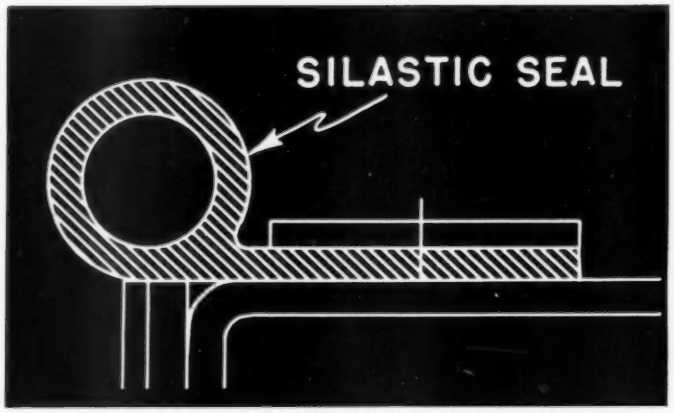
297 MIDLAND AVENUE · DETROIT 3, MICHIGAN

The PLANE

Northrop's F89H Scorpion, missile-carrying interceptor in service with the Air Force. The Scorpion is a two-seat All-weather Interceptor Fighter, flying at over 600 mph with a ceiling of more than 50,000 feet. Power consists of twin Allison J35 turbojets with afterburners.

The PROBLEM

Maintaining an unbroken airfoil between flaps and fuselage fillets. A rubbery seal was desirable, but had to be very resistant to heat because of the engine's proximity. Also had to withstand sub-zero slipstream and repeated abrasion.



The PRODUCT

SILASTIC
SILICONE RUBBER

Northrop designers called for flap seals of Silastic*, the Dow Corning silicone rubber. Silastic is durable, stays rubbery under extreme conditions.

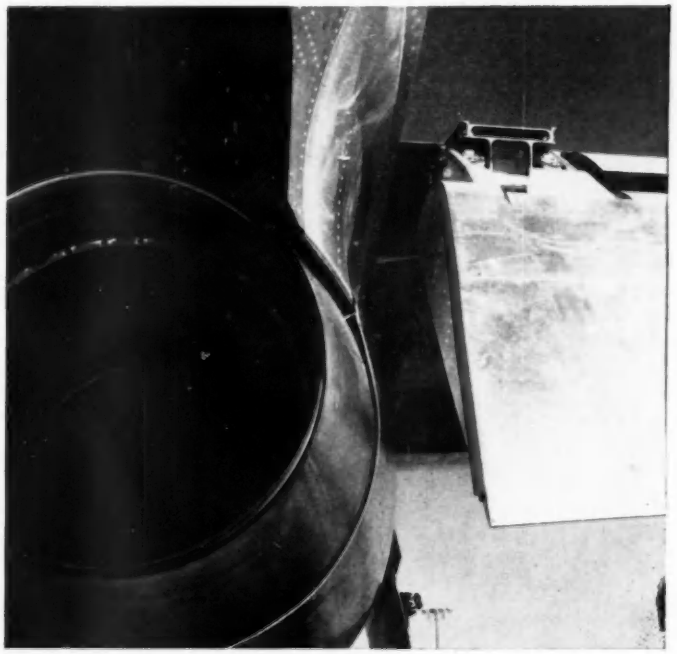
TYPICAL PROPERTIES OF SILASTIC FOR SEALS

Temperature range, °F	—130 to 500
Tensile strength, psi	750 to 1400
Tear Strength, lb/in	100 to 200
Compression set, %, @ 300 F	20 to 40

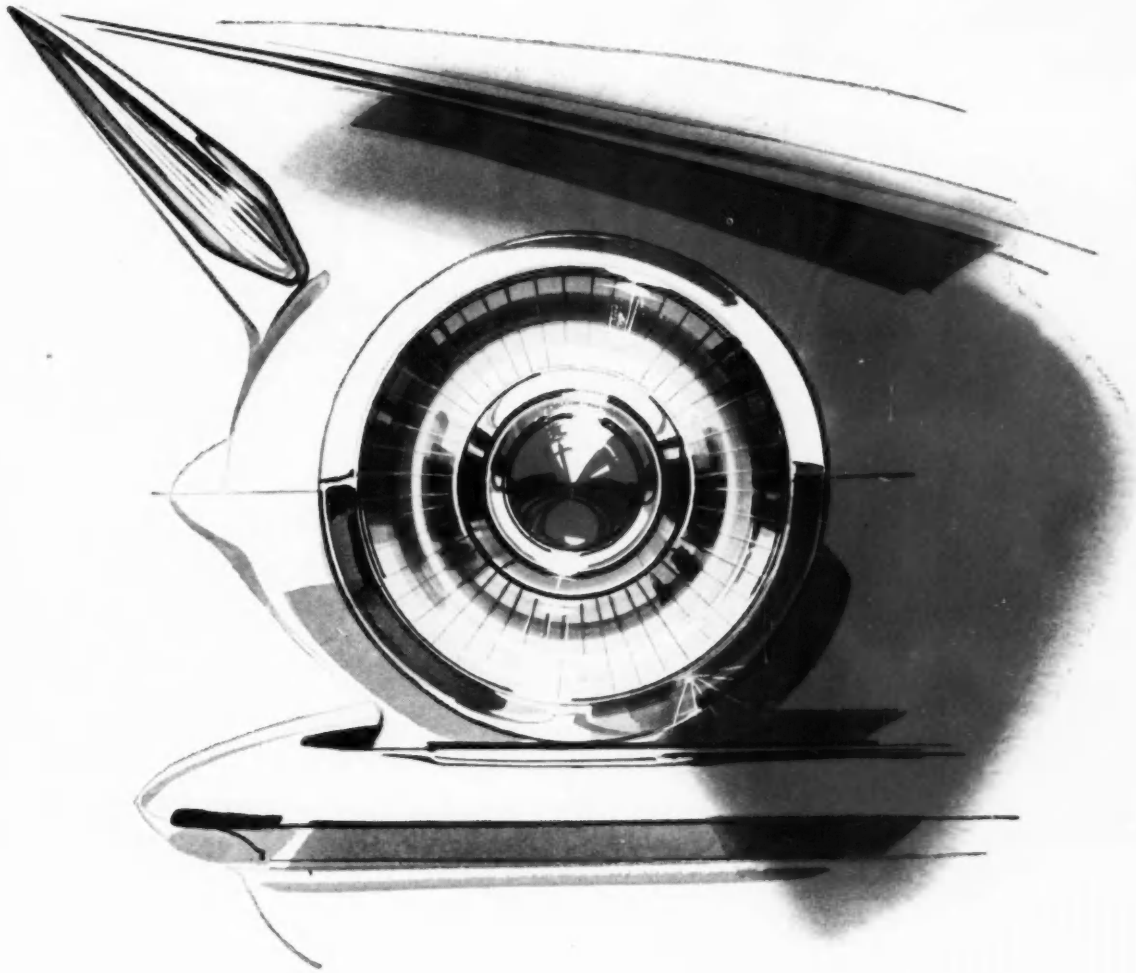
For more information write Dept. 0619.

first in silicones

Dow Corning
CORPORATION
MIDLAND, MICHIGAN



Circle 208 on Inquiry Card, for more data



FIRESTONE FASHIONS "TRAFFIC STOPPERS" IN fashionized ALUMINUM PARTS

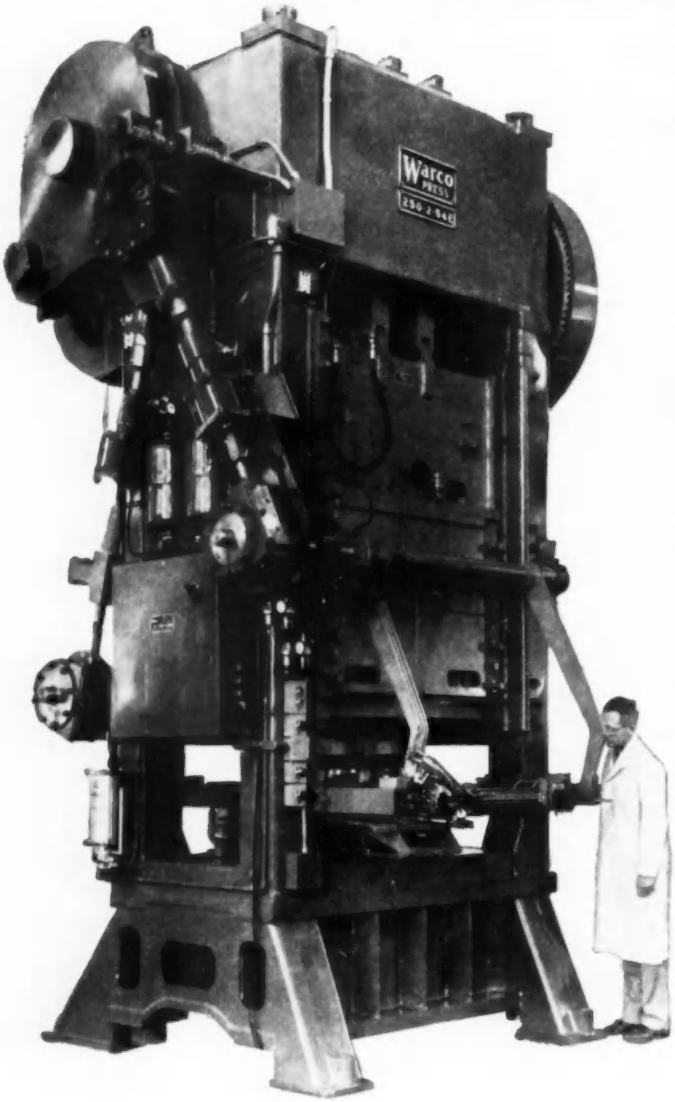
Call on the eye-catching brilliance of Firestone brightwork to put new competitive appeal into your automotive products.

Call on Firestone Fashionized® Aluminum for the finishing touches your new cars need. Call on the custom colors and qualities of this mass-produced medium to pass your closest customer inspection—to say "craftsmanship" down to the last detail.

Call on Fashionized Aluminum, and on Firestone's more than 50 years of fabrication and finishing experience. Call, too, on the production capacities and competitive prices that only an automated anodizing line can supply—in part sizes up to seven feet long. Your inquiries and inspections are cordially invited.

FIRESTONE FASHIONIZED ALUMINUM
FIRESTONE STEEL PRODUCTS COMPANY, AKRON 1, OHIO

Warco automation



You can expect mechanical presses of unsurpassed quality when you specify Warco, for every Warco press is designed and custom built with machine tool precision. The result: Warcos work better, faster—with substantially reduced maintenance.

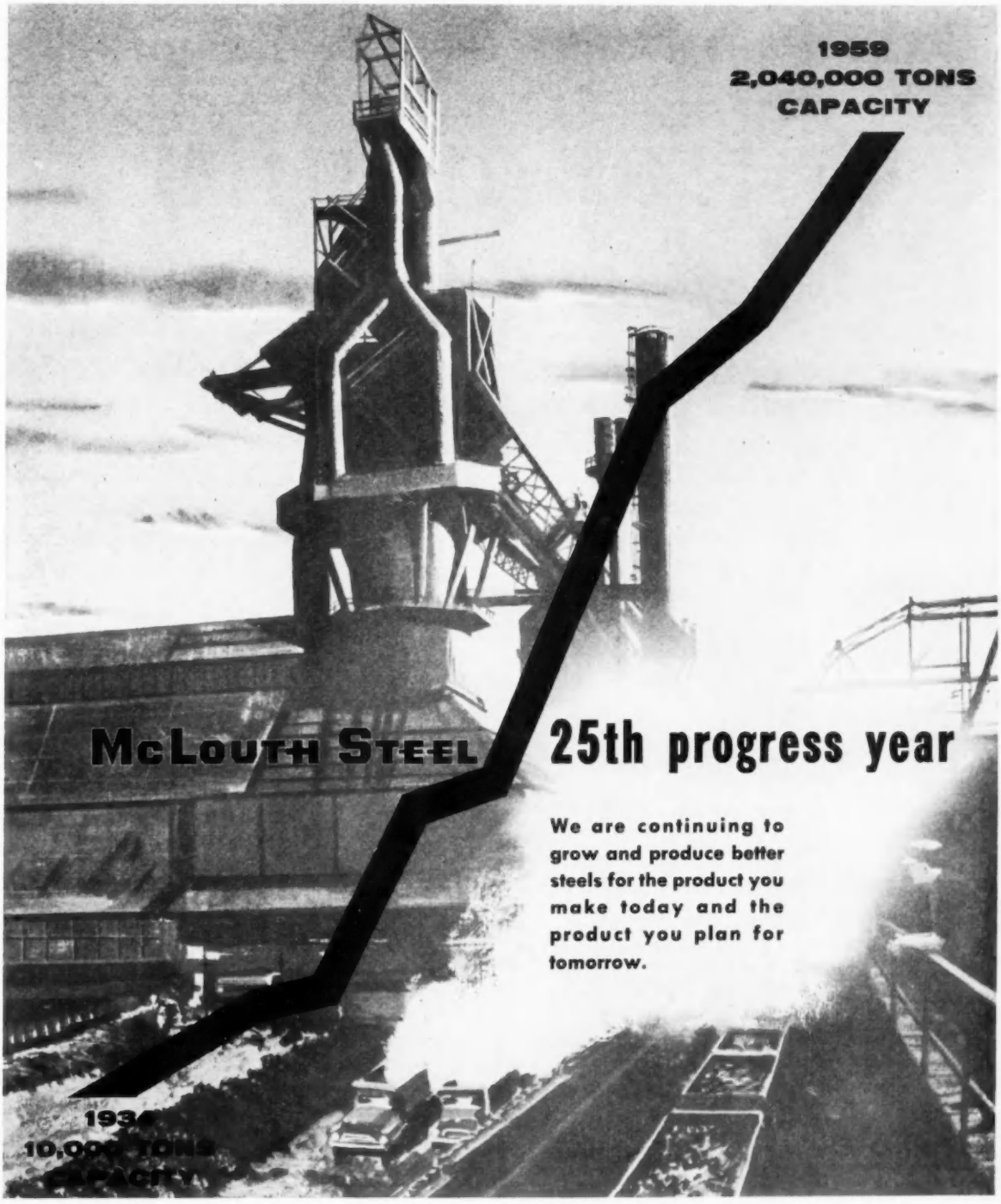
This typical Warco 250 Ton Double Eccentric Shaft Straight Side Press is being used by a leading farm equipment manufacturer to automatically feed and *hot form* the camber and accurately punch and countersink bolt holes in heavy gauge plow shares, discharging them automatically into a heat treating bath. Press slide incorporates a hydro-pneumatic overload device.

If you're considering press equipment, remember . . . if you want maintenance-free quality—you want Warco.

Federal® WELDERS

Warco PRESSES ®

THE FEDERAL MACHINE AND WELDER COMPANY • WARREN, OHIO



McLOUTH STEEL CORPORATION

HOT AND COLD ROLLED SHEET AND STRIP STEELS

Detroit 17, Michigan

Circle 211 on Inquiry Card, for more data

HOW THE ENGINEERING SERVICES OF

Central Foundry

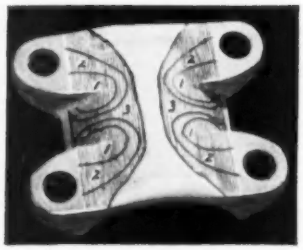
help you design better castings at lower cost

Many new developments here at Central Foundry have broadened the field of application for castings and have given design engineers greater latitude. To assist you in exploiting these new methods and materials to fullest advantage, each of our engineering departments—design, experimental, process and metallurgy—is at your disposal. Central Foundry is also using a number of testing techniques such as stress analysis, cobalt radiography and sonic testing, that have proven invaluable in lowering the cost and improving the quality of castings. These procedures help us to determine the best design and method of producing a casting, either by the green sand method or the shell mold process, and the best material for the casting, either grey iron, malleable iron or ArmaSteel.

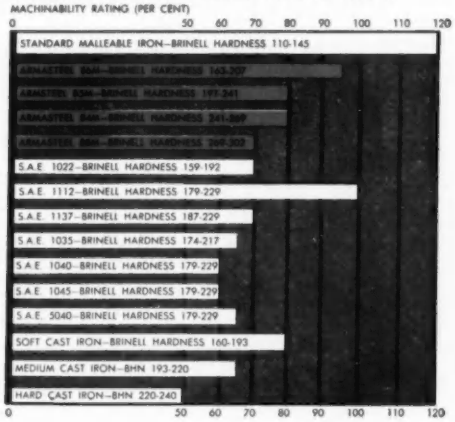
Central Foundry has the capacity to deliver, on schedule, quality castings in production quantities.

STRESS ANALYSIS FOR IMPROVED DESIGN

An important part of our engineering services is the stress analysis laboratory. Stress analysis discovers the amount of stress on a part due to its service function and is an important aid in determining and improving the strength of a part. Improved casting design can be accomplished through the use of stress-analysis by more effectively distributing the metal in the part. The U-bolt anchor plate shown here is a case in point. Our customer was experiencing failures in this part and asked us to see what we could do to solve the problem. Using stress analysis the part was completely redesigned for maximum efficiency. The redesigned part is 35% stronger, 42% lighter and less costly.



EXCELLENT MACHINABILITY FOR INCREASED PRODUCTION



CENTRAL FOUNDRY DIVISION

REDESIGN FOR STRENGTH

This is a rear spring clip pad that was converted to a casting with the help of stress analysis. The clip pad supports the shock absorber arm and clamps the spring to the rear axle of an automobile. When produced as a stamping, this part weighed 4-1/4 pounds. However, when designed as an ArmaSteel casting, weight was reduced to 2-9/10 pounds. Most important, based on comparative stress analysis tests, the casting is *30% stronger* than the stamping. (In addition, the holes are produced by the foundry, making it unnecessary for the customer to punch them.) This conversion from a stamping to a casting resulted not only in increased strength, but in substantial cost savings, as well.

REDESIGN FOR IMPROVED PRODUCT AND ECONOMY

Many of our customers have found that redesigning a product to be made as an ArmaSteel casting rather than as a fabrication, forging or stamping, has resulted in a better part at less cost. The fabricated design of a rear wheel truck hub at the left consists of a forged base with a steel plate welded in place to form the smaller flange. The casting on the right, designed jointly by the customer and our engineers, is of single piece construction, is lighter, stronger and less costly than the fabricated design and eliminates the fitting and welding of the small flange.

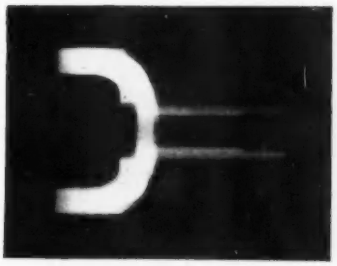
FABRICATED DESIGN ARMASTEEL CASTING

PROCESS ENGINEERING FOR LOWER COST

Our process engineers are continually looking for ways to more economically produce castings, thus lowering the finished-product cost. Shown here is a single casting that combines 5 bearing caps used on a V-8 engine. The casting is almost completely machined as a single piece, and the parts are then separated in a final operation. Substantial savings are realized in both casting and machining costs.

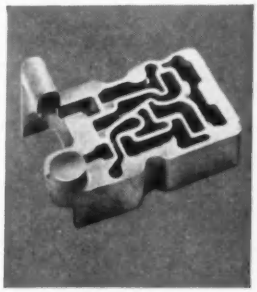
COBALT RADIOGRAPHY FOR ASSURED QUALITY

Radiography, by means of Cobalt 60, has drastically reduced the time required to check castings and is an important aid in obtaining the best possible casting quality. In an effort to eliminate a machining operation on the universal joint yoke shown here, a design change was made in the tube section of the part. When sample castings of the new design were checked radiographically, it was immediately apparent that the design was unsatisfactory since it caused acute metal feeding problems. By redesigning and further checking by radiography, Central Foundry was able to produce, in the shortest possible time, a lighter casting which required less machining in our customer's plant.



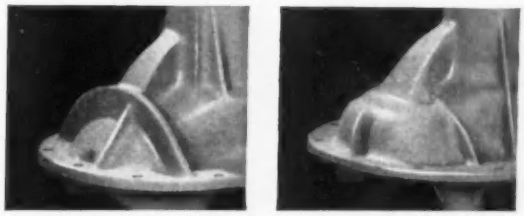
SHELL MOLDING FOR GREATER ACCURACY

Shell molding, a relatively new process of making castings, is now being employed extensively for fast, simple production of complicated castings, such as those requiring narrow, accurate passages and cross sections. It is practically impossible to produce certain parts in any other way without prohibitive costs; this is especially true of ferrous metals. Complicated parts like the manual control valve body shown here, a part of the automatic transmission of a military vehicle, are readily cast in grey iron when the shell process is utilized. The part had been considered as an aluminum die casting, but was thought unsatisfactory because of adverse expansion and wear characteristics. In this case, meeting the requirements for very close tolerances on the thickness and location of ports was made possible by the shell molding process.



REDESIGN FOR WEIGHT REDUCTION

Vehicle weight reduction is a matter of increasing importance to design engineers . . . and more and more existing parts are being converted from a low or medium to a high strength ferrous material such as ArmaSteel. On the left is a grey iron differential carrier currently used in an automobile. By taking advantage of the superior physical properties of ArmaSteel, it was possible to design the part on the right which is *five pounds lighter*. The modulus of elasticity of ArmaSteel is approximately 60% greater (the tensile strength about twice as great) than the grey iron material.



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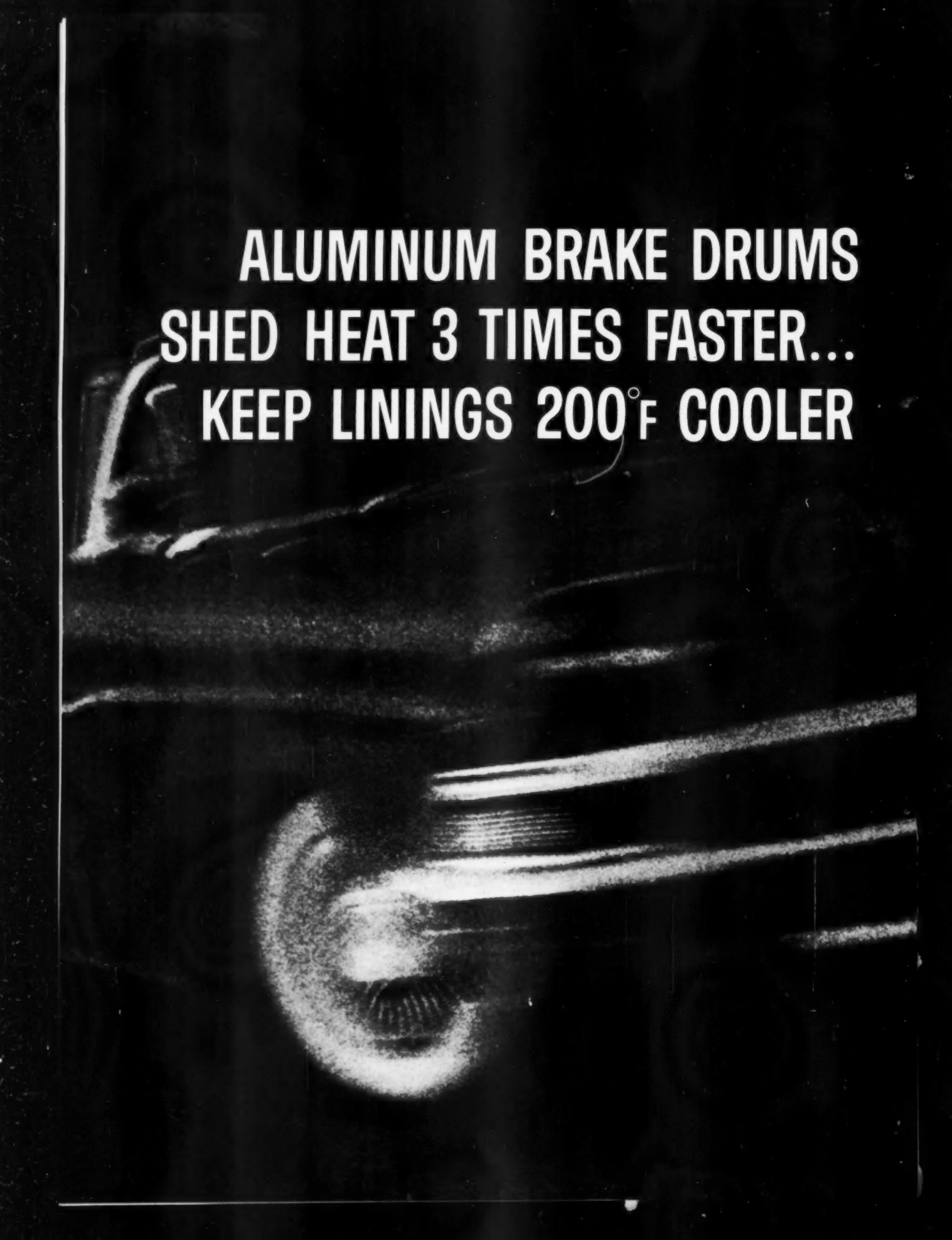
GENERAL MOTORS CORPORATION • SAGINAW, MICHIGAN • DEPT. 24


ALUMINUM BRAKE DRUMS
SHED HEAT 3 TIMES FASTER...
KEEP LININGS 200°F COOLER

Aluminum-Silicon Brake Drum
Aluminum alloy brake drum now undergoing high silicon development and testing. Evaluations show good machining, brake surface condition and braking efficiency.

FOR SAFER, SURER STOPS

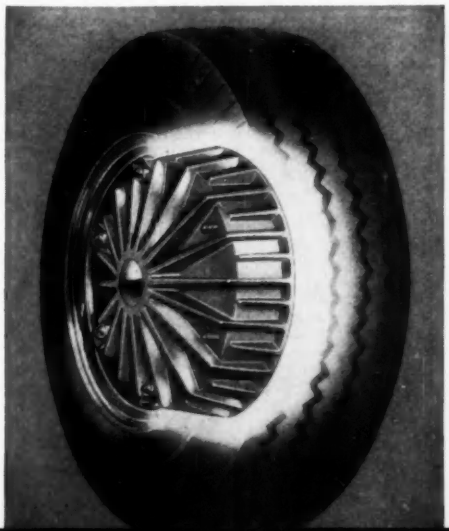
Confronted with design and performance factors that impair brake performance in the newer automobiles, engineers are turning to aluminum and Alcoa for a solution.

Objective: To come up with a brake drum that soaks up heat faster—throws it off faster, as well. Solution: Aluminum, with its high thermal conductivity, not only licks the critical problem of heat dissipation, but it also provides a half dozen other important advantages. Aluminum brake drums have now been standard front-end equipment, proven superior, in one major American automobile and several foreign makes for the past two years. Here's why—

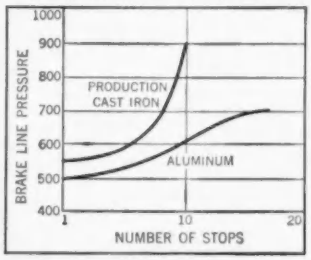
Lower Operating Temperature—Compared to the production cast-iron type, aluminum drums dissipate heat three times faster to reduce brake lining temperatures by 200°F. As a result, fading is substantially reduced or eliminated, brake linings last longer, and other vital parts are protected against the threat of destructive temperatures. With lower operating temperatures come greater stability, faster recovery and freedom from rough, erratic action.

Less Weight, Better Styling—Aluminum brake drums can weigh as little as half as much as the comparable cast-iron type to reduce front-end weight. The designer's metal, versatile aluminum opens new avenues of styling possibilities. Fins and other functional or styling features may be incorporated into the aluminum brake drum.

Let Alcoa Help—Many leading manufacturers have teamed up with Alcoa's Development Division Laboratories in the exploration of new and better aluminum automotive components. The most experienced producer of aluminum in the world, Alcoa offers skilled engineers and unmatched facilities for valuable assistance to you. Bring your design and application problems to Alcoa. Write Aluminum Company of America, 1786-G Alcoa Building, Pittsburgh 19, Pennsylvania.



50-MPH FADE TEST ON AUTOMOBILE BRAKES
Production Cast-Iron Brake Drum vs Aluminum Alloy Brake Drum



Integral Aluminum Hub and Drum Assembly
New design provides maximum exposure to air stream and optimum heat radiating area. Drum back is structural component of wheel and contributes to functional styling.

ALCOA ALUMINUM

ALCOA ALUMINUM GIVES EVERY CAR MORE GLEAM AND GO

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

Circle 213 on Inquiry Card, for more data

MORE WHEELS LIKE THESE MAKE YOUR BUSINESS GO ROUND

A little to the left — lower it — lock it on — and another motor scraper is just about ready to roll.

But it's barely the beginning, "Staggering" is the only word for the federal highway program, and staggering is the quantity of construction vehicles and equipment needed to complete it. *And this means more business for you!*

Total expenditures, federal and state, are expected to top 100 billion before it's done. Over $20 billion will go for roadbuilding equipment alone!

Already the tremendous demand for new powered construction and materials-handling equipment is being felt. Manufacturers are planning and tooling for it NOW: evaluating new products and components to build into their equipment, studying new processes and methods to build it faster, better, more economically.

This mounting demand is creating tremendous sales potential for you! That's why the time to sell is NOW — and the place to keep selling is AI. Because powered construction equipment represents only one "cylinder" of the $32 billion, 8-cylinder AI market that includes Passenger Cars; Aircraft and Missiles; Trucks, Buses and Trailers; Tractors and Powered Farm Equipment; Military Vehicles; Engines, Parts and Accessories. *Only AI gives you all 8 cylinders!*

Have you read "The New America That's Coming" by the editors of Automotive Industries? A limited quantity available — please write on your letterhead — no obligation.

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Contact your nearest rep and learn why!

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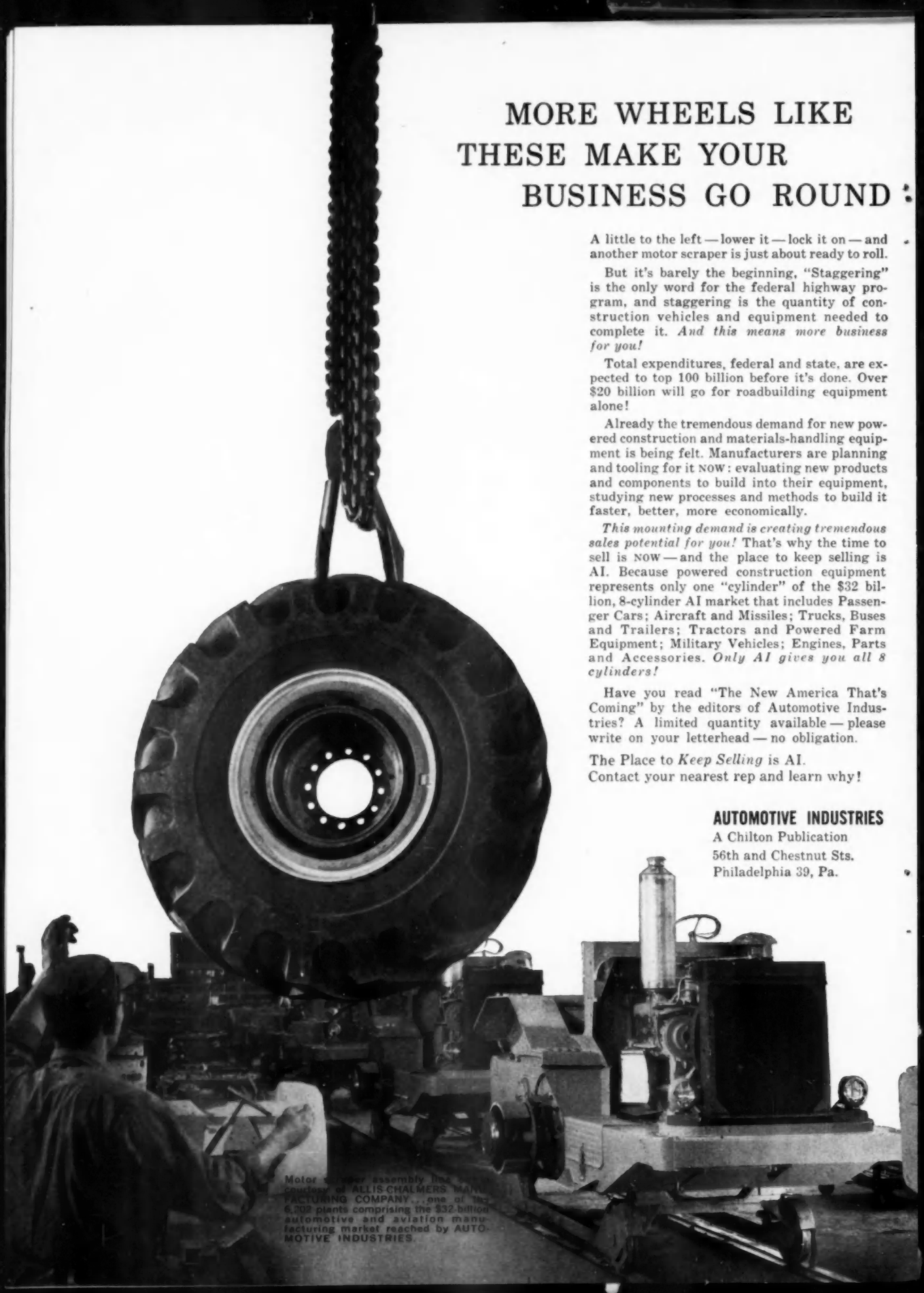
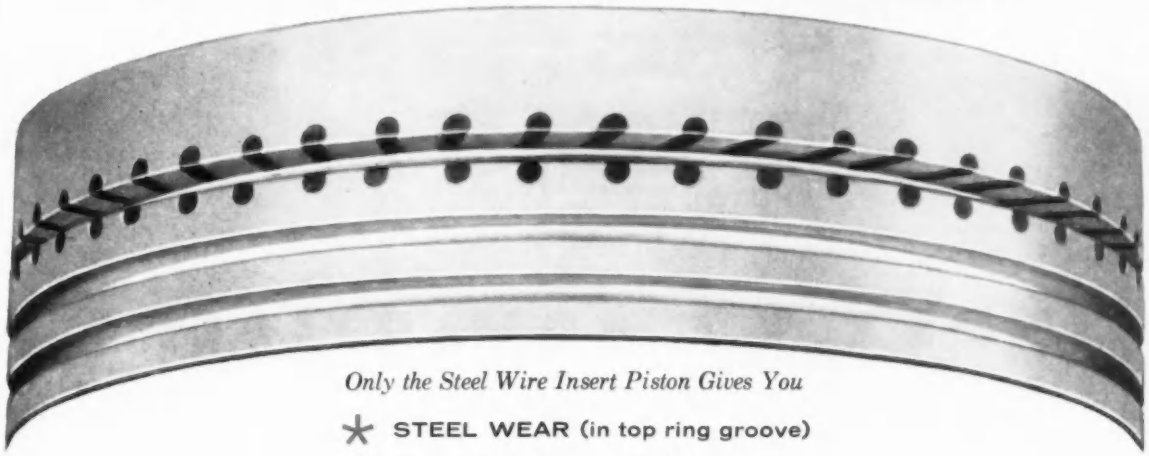


Motor scraper assembly line courtesy of ALLIS-CHALMERS MANUFACTURING COMPANY . . . one of the 6,702 plants comprising the $32-billion automotive and aviation manufacturing market reached by AUTOMOTIVE INDUSTRIES.

Got a tough
PISTON PROBLEM?



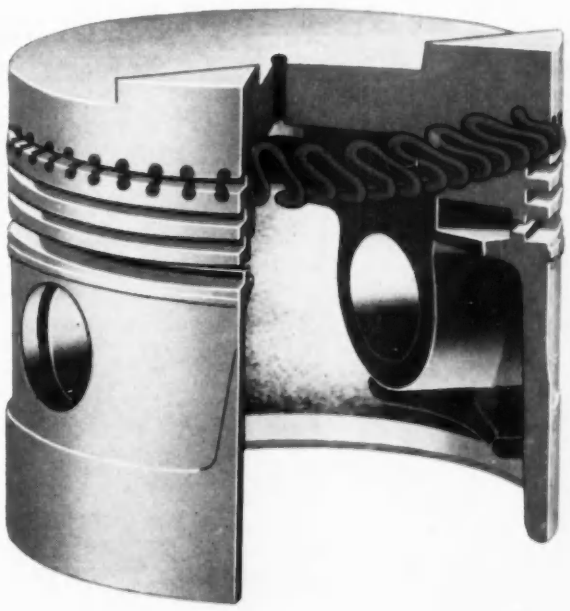
Only the Steel Wire Insert Piston Gives You

- STEEL WEAR (in top ring groove)
- ALUMINUM LIGHTNESS
- UNRESTRICTED HEAT FLOW

reduce the wear where the work is done... with

G&E WIRE INSERT PISTONS

Reducing top ring groove wear is the key to superior piston performance. G&E's patented wire reinforcing plus rapid, uniform heat flow keeps "tight as new" tolerances for remarkable mileages. Aluminum-light, steel-strong construction increases engine power and economy. G&E Wire Insert Pistons have a proven record for low cost per mile and trouble-free operation under the severest truck, tractor and construction uses. You'll save money, maintenance time, and break-down delays for your customers—by specifying the use of G&E Wire Insert Pistons.



Write for the G&E Steel Wire Insert Piston story today!

GILLETT AND EATON, INC.
841 Doughty St., Lake City, Minn.

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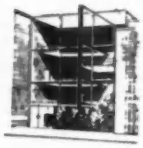
A CHILTON  PUBLICATION

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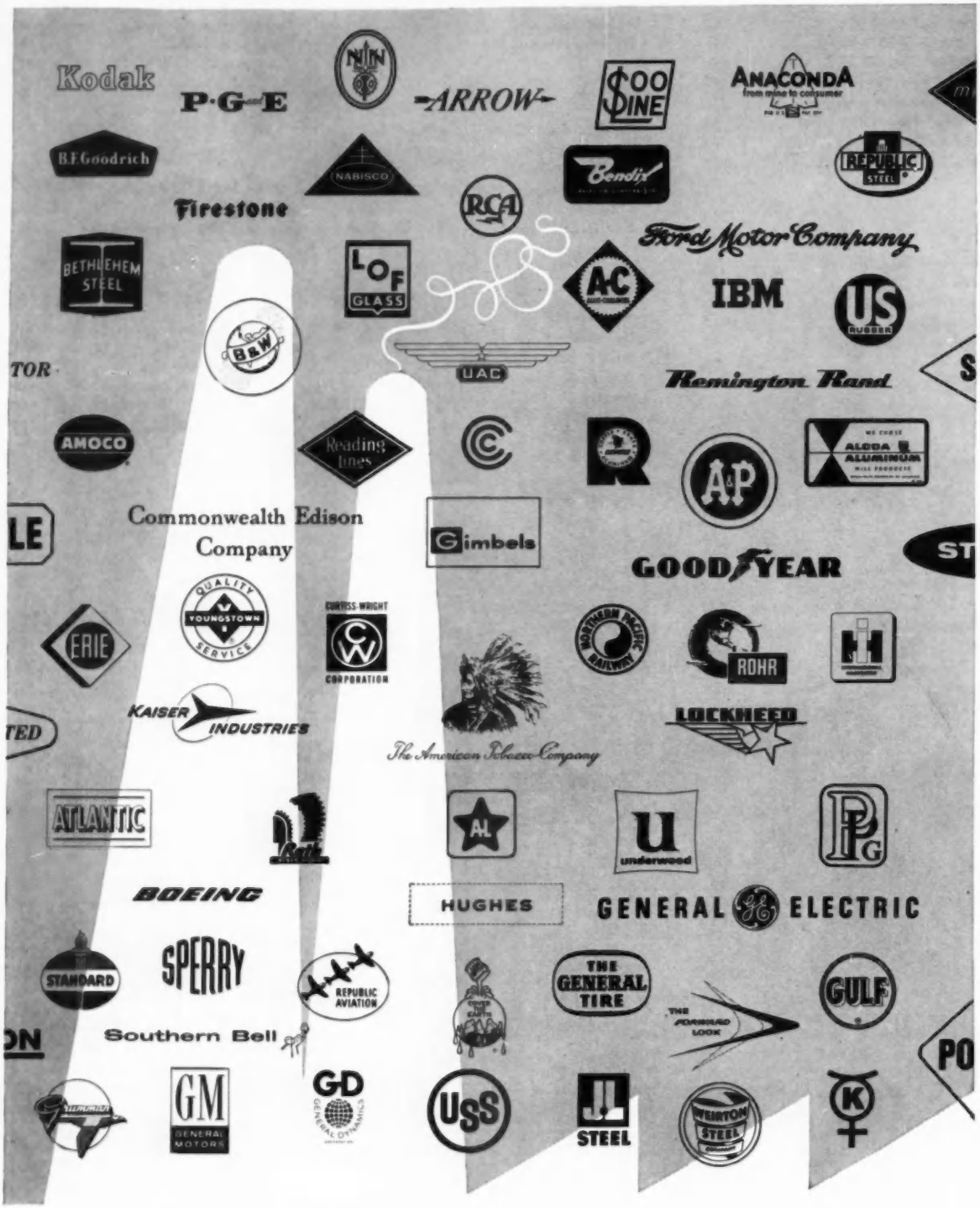

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FREE LITERATURE

Carbide Grinding 1

"Carbide Grinding with Man-Made Diamond Wheels" is a practical condensation of facts and recommendations on man-made diamond wheels. It sets forth the characteristics of man-made diamonds, diamond wheel shapes and offers application suggestions. *The Carborundum Co.*

Flame Ceramic Process 2

A new brochure describes the flame ceramic process for protecting metals against temperatures up to 5500 F, including its application equipment and data on ceramic powders. This six-page brochure is entitled "Flame Ceramics." *Continental Coatings Corp.*

Stainless Steel 3

A four page folder describing a sulphuric acid-resistant stainless steel called "Union 20-S" lists forms in which the corrosion-resistant alloy is stocked and gives general corrosion and welding information. *Union Steel Corp.*

Machine Tools 4

A revised 48 page catalog, describing the complete line of Walker-Turner light-heavyweight machine tools and accessories, has been issued by *Rockwell Mfg. Co., Walker-Turner Power Tool Div.* Among the tools featured are drill presses, grinders, cut-off machines, band saws and belt and disc surfacers.

High Speed Indexing 5

Catalog 108, 24 pages, gives data on high speed, precision, roller gear drive indexing mechanisms for achieving intermittent and oscillating motions. Included are units rated for speeds up to 2000 indexes a minute with precision of 0.001 in. and zero backlash for 8000 to 20,000 hours operation. *Ferguson Machine Corp.*

Spiroid Gears 6

"Lower Cost Design Begins with Spiroid Gears" is the title of a 36 page engineering manual published by the *Spiroid Div. of the Illinois Tool Works.* The book will assist design engineers in determining basic design requirements such as ratings, selections, center distances, bearing loads, mounting methods, etc.

(Please turn page)

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FREE LITERATURE — *Continued*

Tractor Information 7

Booklet 33341, eight pages, presents information for measuring tractor value. Entitled "Five Yardsticks," the two-color brochure gives five standards to be considered: performance, dependability, matched equipment, serviceability, and dealer organization. These yardsticks are applied to tractors in the D8-D9 class. *Caterpillar Tractor Co.*

Heavy Equipment 8

Two pieces of literature are available from the *Construction Machinery Div. of Allis-Chalmers Mfg. Co.* MS-1312 gives engineering features of the TS-260 motor scraper powered by the Allis-Chalmers 16000 Diesel engine which develops 230 hp. MS-1251 covers the HD-6 Diesel powered crawler tractor. Specifications are included.

Cams, Camshafts 9

Meehanite Metal Corp. has published a 12-page booklet entitled "Meehanite Cams, Camshafts and Crankshafts," which devotes itself primarily to application problems solved by Meehanite products. It also discusses basic metallurgy and engineering properties of several types of Meehanite metal used for such service.

Filter Assemblies 10

Six page, two-color Catalog, BFD-64 explains five standard lines of high and low pressure T-type in-line filter assemblies, replacement filter elements, dual bowl filters, and differential pressure indicator filter assemblies for use in aircraft, missiles, test stands and ground support equipment, as well as for general industrial use. *Bendix Filter Div., Bendix Aviation Corp.*

Silicone Rubbers 11

Seven data sheets are available on a family of seven new silicone rubber compounds. Specifications, physical properties, and typical applications are described in detail. *Dow Corning Corp.*

Low-Cost Tooling 12

A Delta case book, a Blue Book on industry's approach to low-cost tooling with standard industrial power tools, is available from *Delta Power Tool Div., Rockwell Mfg. Co.*

Lubrication System 13

A new midget size Accumite centralized lubrication system, which provides a measured quantity of proper lubricant to each bearing of a production machine or vehicle, is described in Form 34-28. *Alemite, a Div. of Stewart-Warner Corp.*

Tooling Plate 14

Properties, specifications, and availability of Reynolds Type 33 wrought aluminum tooling plate are described in "Reynolds Wrought Aluminum Tooling Plate Type 33," a booklet prepared by the *Reynolds Metals Co.*

Pressure Readout 15

Catalog 30B1000, 12 pages, describes F & P multiple pressure readout system which measures and records hundreds of different pressures simultaneously using a single high accuracy transducer. *Fischer & Porter Co.*

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FREE LITERATURE—
continued

Plant-Facilities 16

Universal-Cyclops Steel Corp. announces an eight page color brochure on their new plant and facilities for cold finishing of stainless steel strip. The new plant adds an additional 20,000 tons of stainless strip annually to the company's capacity.

Arc Welding Procedures 17

The Babcock & Wilcox Co. has published a data card which summarizes various recommendations for arc welding. In addition to indicating the proper type of electrode to be used, the card provides information on suggested pre-heat and post-heat treatments.

Metal Powders 18

"Prealloyed Metal Powders" is the title of a brochure published by the *Vanadium-Alloys Steel Co.* for distribution to fabricators interested in applications involving the use of metal powders.

Press Brake Line 19

Bulletin 90 contains full information on Niagara's redesigned and expanded line of Series 1B press brakes. Fully described are 15, 30, and 60 ton machines. *Niagara Machine & Tool Works.*

Roller Bearings 20

Catalog PL-559 explains the features, applications, and availability of nine principal lines of roller bearings. *Rollway Bearing Co.*

Positioning Control 21

Bulletin GEC-1531, six pages, describes a complete line of standard, pre-engineered point-to-point numerical positioning control "packages" for use on any machine requiring point-to-point positioning of linear or rotary-motion members. *General Electric Co.*

(Please turn page)

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Rotary Automatic 22

Acme rotary automatic polishing and buffing machines for polishing and buffing, de-burring, wire brushing, and micro-finishing with set up wheels, buffs, brushes, or abrasive belts, are described in a 12 page bulletin prepared by the *Acme Mfg. Co.*

Structurals 23

Ideas that promote fast, economical building construction through the use of lightweight steel structurals are highlighted in a booklet published by *Jones & Laughlin Steel Corp.*

Cutting Torch 24

Form ADC 880, 12 pages, on a complete line of machine cutting torches, tips, and accessories, has been published by *Air Reduction Sales Co., a Div. of Air Reduction Co., Inc.*

Screw Catalog

Catalog P-1, eight pages, lists prices on packaged wood screws, Type A tapping screws, machine screws, machine screw nuts, stove bolts, and carriage bolts. Address request on company letterhead to *Southern Screw Co., P. O. Box 1360, Statesville, North Carolina.*

Metal Stampings

Design suggestions for metal stampings are presented in a 12-page booklet which discusses in detail a number of the mechanical problems faced in the fabrication of a small stamping. Please address request on company letterhead to *Dayton Rogers Mfg. Co., Minneapolis 7, Minn.*

Industrial Eyelets

Prepared for users of industrial eyelets and others who have fastening problems which can be solved with eyelets, a 48 page catalog, outlines the design, development, and production of eyelets and eyeletting machines for such industries as metalworking, rubber, plastics, electrical, electronic, and packaging. Address request on company letterhead to *Eyelet Dept., United Shoe Machinery Corp., 140 Federal Street, Boston 7, Mass.*

The "Long Life" Piston with Cast-Anchored Steel Top Ring Section

CONTINUOUS PERMA-GROOVE*

SUPERIOR PERFORMANCE FOR GASOLINE ENGINES

- ★ HIGHEST WEAR RESISTANCE
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- ★ MINIMUM OIL CONSUMPTION
- ★ MINIMUM WEIGHT INCREASE
- ★ ECONOMICAL IN COST
- ★ ADAPTABLE TO ANY TYPE PISTON

We suggest an immediate test of "Continuous Perma-Groove" advantages for your gasoline engine.

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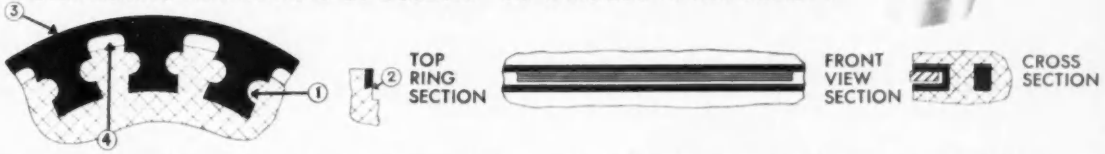

1. Cast-anchored—no bimetal expansion problem.
2. Dovetailed edges keep insert securely in place.
3. 100% steel bearing area for wear resistance.
4. 40% aluminum bearing area exposed for heat conductivity and cool operation.
5. Light in weight.

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ZOLLNER PISTONS

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ZOLLNER

ZOLLNER CORPORATION • Fort Wayne, Indiana

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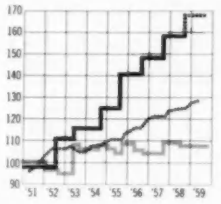
ANOTHER THING THEY HAVEN'T COPIED IS OUR NICKEL-RICH TIMKEN® STEEL

Most tapered roller bearings *look* alike. (Fact is, they're mostly made according to Timken® bearing design.) But when it comes to trouble-free mileage, there's a colossal difference. One reason for this difference is Timken nickel-rich steel!

Nickel-rich steel responds best to heat-treating, to give you the right combination of hardness and toughness you need if you want your bearings to stand up. And you'll find *only* nickel-rich steel in Timken bearings. What's more we make our own steel so we can control quality at every step. No other American bearing manufacturer makes its own steels.

Your engineers know all about this. Their tests or service experience show that Timken tapered roller bearings stand up better, give your customers worry-free driving, contribute to smooth operation in related parts. So if you're looking for ways to cut warranty costs in cars, trucks and busses, ask your engineers about Timken bearings.

The extra quality of Timken bearings costs you nothing extra. With the most advanced bearing plant in the world at Bucyrus, Ohio, we've led the way in keeping bearing quality high—costs low as shown on the chart. What's more, you get engineering service you can't get anywhere else. You'll save when you specify "Timken" instead of a part number. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.



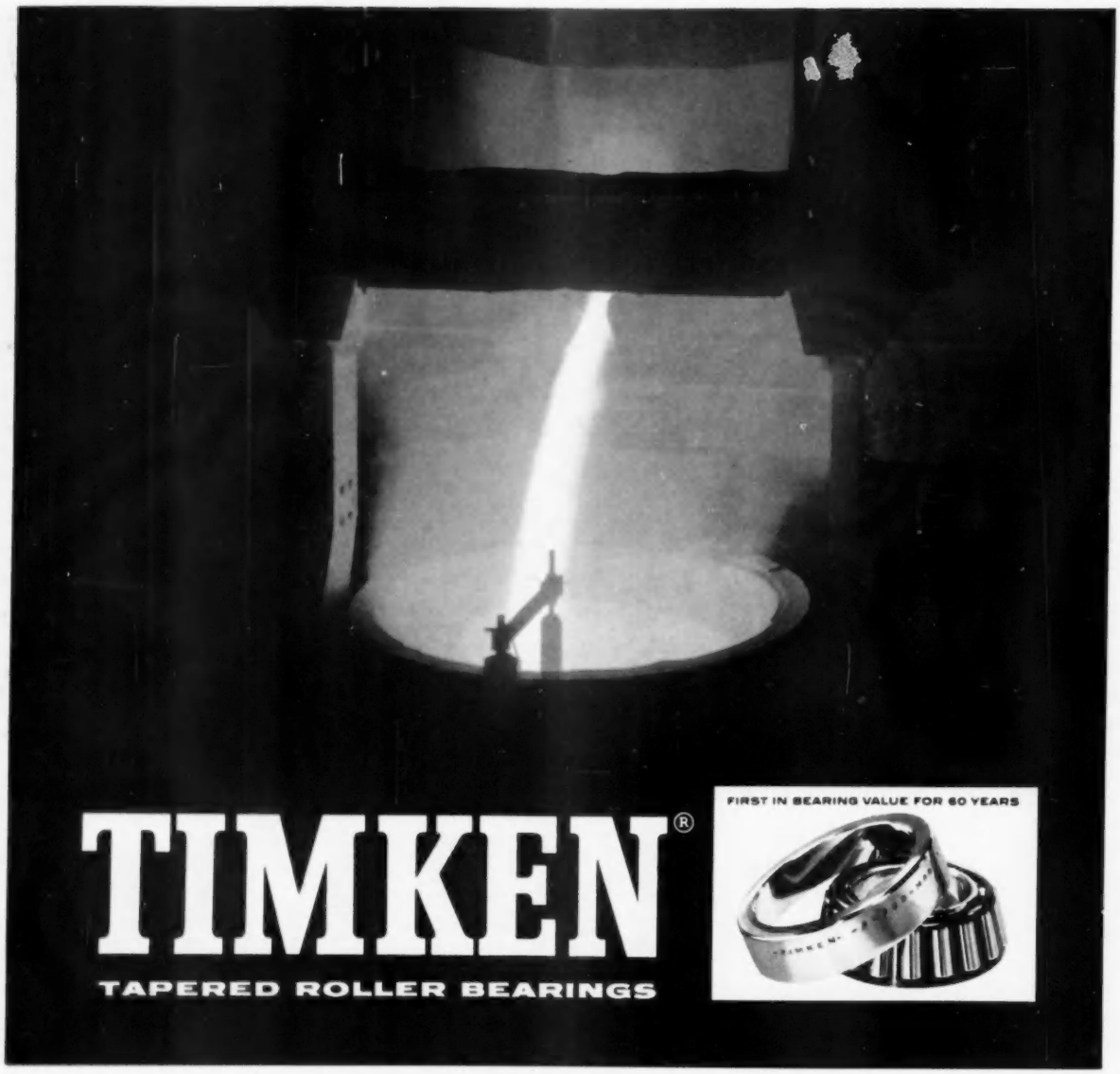
While many costs have gone up, the cost of Timken bearings has stayed low.

— TIMKEN COMPANY LABOR COSTS

----- PASSENGER CAR PRICES*

— TIMKEN BEARING PRICES

Index base, 1951=100
*BLS wholesale prices



Circle 103 on Inquiry Card, for more data